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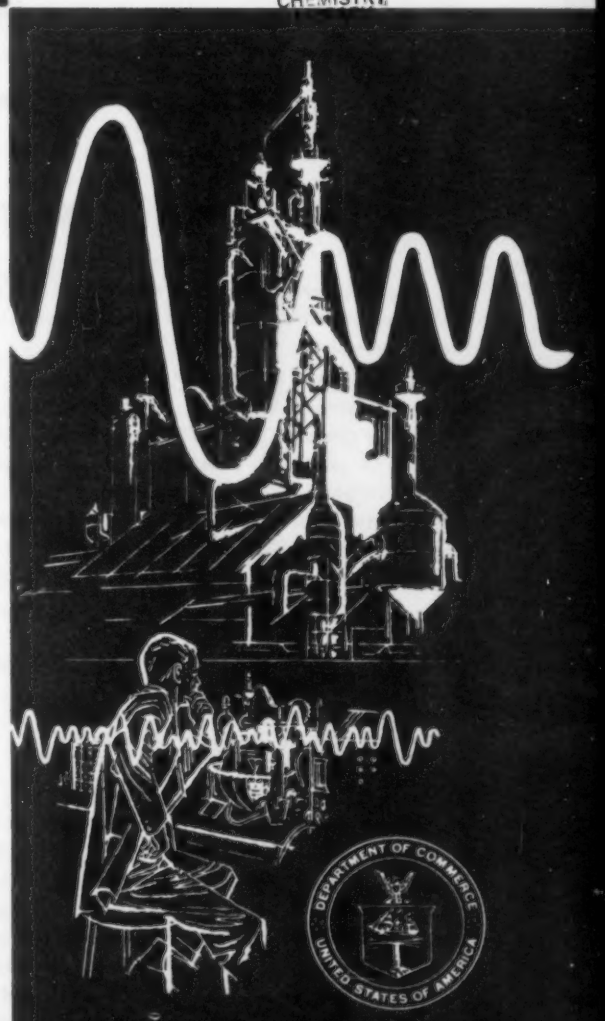

U. S. DEPARTMENT OF COMMERCE
BUSINESS AND DEFENSE SERVICES ADMINISTRATION
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U.S. GOVERNMENT RESEARCH REPORTS

U.S. DEPARTMENT OF COMMERCE
Luther H. Hodges, *Secretary*

BUSINESS AND DEFENSE SERVICES ADMINISTRATION

Office of Technical Services
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TECHNICAL ABSTRACT BULLETIN

1. AIRCRAFT AND FLIGHT EQUIPMENT

AD-264 743 Div. 1
(TIPSB/MS) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
ANALYTICAL AND PRELIMINARY SIMULATION STUDY OF A PILOT'S ABILITY TO CONTROL THE TERMINAL PHASE OF A RENDEZVOUS WITH SIMPLE OPTICAL DEVICES AND A TIMER,
by Edgar C. Lineberry, Jr., Roy F. Brissenden, and Max C. Kurbjun. Oct 61, 23p. incl. illus. tables (Technical note D-965)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-965.

DESCRIPTORS: (*Pilots, *Space flight, *Astronautics, Control of Satellite rendezvous vehicles, Simulation, Tests.) (*Optical equipment, Measurement, Orbital flight paths, Mathematical analysis.)

A combined analytical and preliminary simulation study was conducted to determine the ability of a human pilot to control the rendezvous by using visual sightings made during the initial collision-course control to obtain the range and closure rate. The analytical phase of the study reviewed the geometric relations between the vehicles and formed the basis for techniques to transform the angular sightings into range and closure rate. A preliminary simulation was then made to investigate the accuracy of these techniques. The simulation consisted of an analog computer, an oscilloscope to represent the view a pilot would have with a stabilized sight, and a timer. Results indicate that pilots, using an optical sight and a timer, can successfully arrest the angular motion of the line of sight between two rendezvous vehicles and obtain relative range and closure rate with sufficient accuracy to perform the final braking maneuver successfully. (Author)

AD-264 752 Div. 1, 28
(TIPSP/MFA) OTS price $3.60

North American Aviation, Inc., Columbus, Ohio.
A FLIGHT SIMULATOR STUDY OF THE LATERAL-DIRECTIONAL STABILITY REQUIREMENTS OF PILOTED AIR VEHICLES,
by W. E. Palmer. 31 Mar 61, 27p. incl. illus. (Rept. no. NA 61H-241)
(Contract NOw 60-0314-d)
Unclassified report

DESCRIPTORS: (Oscillation, *Flight simulators, *Stability (Lateral), Pilots, Attitudes, Aircraft, Tests.) (*Damping, Acceleration, Frequency, Roll.) (Flight instruments, Gyro stabilizers, Compasses, Accelerometers, Airspeed indicators, Mach number, Rate-climb indicators, Altimeters, Oscilloscopes.) Pilots.

A stationary flight simulator study was made of the primary factors which affect pilot opinion of the lateral-directional stability of contemporary aircraft. The results indicate that the degree of acceptability of the lateral-directional characteristics of any aircraft can be predicted for a wide range of configurations by use of two correlation parameters. One parameter specifies the minimum required damping of the lateral oscillation, and the other specifies the maximum allowable lateral control yawing moment. (Author)

AD-264 880 Div. 1, 9
(TIPSA/WAW) OTS price $2.25

National Aeronautics and Space Administration, Washington, D. C.
A TRANSONIC INVESTIGATION OF CHANGING INDENTATION DESIGN MACH NUMBER ON THE AERODYNAMIC CHARACTERISTICS OF A 45-DEGREE SWEPTBACK-WING--BODY COMBINATION DESIGNED FOR HIGH PERFORMANCE,
by Donald L. Loving. Oct 61, 86p. incl. illus. tables, 16 refs. (NASA Technical note no. D-941, Supersedes NACA RM L55J07, AD-80 849)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-941.

DESCRIPTORS: (*Aerodynamic configurations, *Wing-body configurations, *Swept-back wings, Wind tunnel models, *Supersonic planes, Airfoils, *Transonics, Aerodynamics, Supersonics, Lift, Drag, Moments, Stability, Model tests.)

The wing, designed to have high performance characteristics when used with an indented body, was tested in combination with an unindented body and bodies indented for mach numbers of 1.0, 1.2, and 1.4. At a given supersonic mach number, lowest values of zero-lift wave drag and highest values of maximum lift-drag ratio for the wing-body combinations were obtained at or near the specific mach number for which the body indentations were designed. Maximum lift-drag ratios of the order of 20 at subsonic speeds, 15 at mach number 1, 13 at mach 1.2, and 9 at mach 1.43 were obtained. Theoretically computed zero-lift wave drag was considered to be in good agreement with the experimental results.

AD-264 881 Div. 1
(TIPSA/NTM) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
RAPID-TRANSITION TESTS OF A 1/4-SCALE MODEL OF THE VZ-2 TILT-WING AIRCRAFT,
by Louis P. Tosti. Oct 61, 37p. incl. illus. table (NASA Technical note no. D-946)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-946.

DESCRIPTORS: (Aerodynamics, Stability (Longitudinal), Control, *Vertical take-off planes, Acceleration, Deceleration, Pitch, Model tests, Flight testing.)

An investigation of the longitudinal stability and control characteristics of a 1/4-scale model of the VZ-2 tilt-wing vertical-take-off-and-landing aircraft during rapid transitions has been made on the Langley control-line facility. Only the longitudinal characteristics were studied because with the control-line technique the other phases of the model motion are partially restrained. The rapid transitions from hovering to forward flight could be performed easily at any of the accelerations attempted; whereas, the transitions from forward flight to hovering were generally accompanied by a strong noseup pitching moment which at times was uncontrollable because of an inadequate amount of available pitch control. The model was more difficult to control during rapid decelerations than during slow decelerations and was also more difficult to control for rearward center-of-gravity conditions than for forward ones. (Author)

AD-264 950 Div. 1
(TIPSB/MS) OTS price $3.60

General Mills, Inc., Minneapolis, Minn.
INFLATION TEST AND BALLOON LAUNCHING FROM NAVAL VESSEL ON LAKE MICHIGAN (PROJECT WETFOOT),
by David A. Church. 1 Oct 61, 36p. incl. illus.
(Rept. no. 2227)
(Contract Nonr-158922)
Unclassified report

DESCRIPTORS: (*Balloons, *Launching from Naval vessels, Test methods, Tests.)

It is concluded that the deployment and inflation method is very easy to accomplish; definitely easier than a land operation of comparable size. The method of weigh-off allows a faster operation since the cylinders do not have to be bled to zero pressure. Also, the weigh-off assures proper lift with no possibility of gas metering errors. The method allows all of the advantages of a vertical inflation, including the freedom from launching shocks imposed by the standard platform-type operation. A remaining item of uncertainty in the deployment and inflation technique is the unknown effect of a highly disturbed sea surface. The flight revealed no adverse effects on balloon performance; behavior was typical of a land-launched skyhook balloon. (Author)

AD-265 088 Div. 1, 27
(TIPSM/BRW) OTS price $1.10

Scintilla Magneto Div., Bendix Corp., Sidney, N. Y.
DEVELOPMENT OF A FLAMEOUT SENSOR FOR RAPID RELIGHT OF TURBO-JET ENGINE.
Progress rept. no. 1, 16 May-15 June 61,
by W. S. Moore, Jr. 20 June 61, 7p. incl. illus.
(Contract NOw-61-0579-f)
Unclassified report

DESCRIPTORS: (*Safety devices, Design, *Turbojet engines, Combustion, Pressure, Temperature, *Ignition systems.) (Detection, Monitors, Hazards.)

In a program directed to the development, design and test demonstration of a device for detecting flame-out in a turbo-jet engine it is concluded that compressor discharge pressure is the most feasible actuating medium. The preliminary design of a device sensitive to negative rate of pressure change for actuating the engine ignition system in the event of flame-out is described. (Author)

AD-265 089 Div. 1, 27
(TIPSM/BRW) OTS price $1.10

Scintilla (Magneto) Div., Bendix, Corp., Sidney, N. Y.
DEVELOPMENT OF A FLAMEOUT SENSOR FOR RAPID RELIGHT OF TURBO-JET ENGINE.
Progress rept. no. 2, 16 June-15 July 61,
by W. S. Moore, Jr. 20 July 61, 7p. incl. illus.
(Contract NOw-61-0579-f)
Unclassified report

DESCRIPTORS: (*Safety devices, Design, *Turbojet engines, Combustion, Pressure, Temperature, *Ignition systems.) (Detection, Monitors, Hazards, Tests.)

In a program directed to the development, design and test demonstration of a device for detecting flame-out in a turbo-jet engine, breadboard and prototype devices were delivered to the Naval Air Turbine Test Station, Trenton, New Jersey, for functional test. General requirements for the test program are described. Author)

AD-265 090 Div. 1, 27
(TIPSM/BRW) OTS price $1.10

Scintilla (Magneto) Div., Bendix Corp., Sidney, N. Y.
DEVELOPMENT OF A FLAMEOUT SENSOR FOR RAPID RELIGHT OF TURBO-JET ENGINE.
Progress rept. no. 3, 16 July-15 Aug 61,
by W. S. Moore, Jr. 18 Aug 61, 6p. incl. illus.
(Contract Now-61-0579-f)
Unclassified report

DESCRIPTORS: (*Safety devices, Design, *Turbojet engines, Combustion, Pressure, Temperature, *Ignition systems.) (Detection, Monitors, Hazards, Tests.)

In a program directed to the development, design, and test demonstration of a device for detecting flame-out in a turbo-jet engine, breadboard and prototype devices were delivered to the Naval Air Turbine Test Station, Trenton, New Jersey, for functional test. The test program was delayed by malfunction of the test facility and attendant rescheduling problems. (Author)

AD-265 108 Div. 1
(TIPSA/WAW) OTS price $1.60

General Dynamics/Convair, San Diego.
PERFORMANCE AND WEIGHT STUDIES FOR A CARGO AIRPLANE AND ELECTRONIC WARFARE TRAINER. CONVAIR 990 JET TRANSPORT.
Sep 61, 15p. incl. illus. (Rept. no. ZP-351)
Unclassified report

DESCRIPTORS: (*Transport planes, *Jet training planes, Training planes, Jet planes, Range, Take-off, Airplane landings, Design, Load distribution.) (Casualties, Air transportation, Military personnel.) (Radio operators, Radar operators, Military personnel, Training.)

The Convair 990 Jet Transport has been proposed, with modifications, as a cargo, troop transport, and air evacuation vehicle. Similarly, it has been proposed as an electronic warfare trainer (EWT). A brief summary is presented of the calculated airplane performance and weights for utilization of the 990 as both a basic cargo and a combination cargo and EWT vehicle. The cargo airplane weights reflect the addition of the cargo door and flooring to the existing airplane. Modifications to the cargo weight required for troop transport and air evacuation utilization are also shown. For the EWT version, weight for the electronic requirements is added to the basic cargo airplane. When the EWT airplane is to be flown in the troop-transport or the air-evacuation configuration, the EWT provisions may be removed from the cargo deck. Certain EWT cabling, generating equipment and antennas outside the cargo deck area remain on board. Performance figures are based on data generated by the current flight-test-airplane configuration and are preliminary. (Author)

AD-265 161 Div. 1
(TIPSA/CCD) OTS price $9.60

General Mills, Inc., Minneapolis, Minn.
INDIA BALLOON PROGRAM.
Final rept.,
by D. A. Dietsche and D. V. Crowe. 28 July 61, 1v. incl. illus. tables (Rept. no. 224)
(Contract AF 19(604)7338)
(AFCRL-847) Unclassified report

DESCRIPTORS: (*Balloons, Balloon launchers, Balloon gondolas, Flight paths, Particles, Nuclei, Impingers, Aerosols, Photographic emulsions, Launching, Tracking, Recovery, Instrumentation, India, Flight testing.)

Efforts were concerned with preparation, launch, tracking, monitor, cutdown and recovery of 22 balloon flights from a launching site at Hyderabad, India. The results of the flights include time versus altitude and temperature versus altitude curves for each flight along with calculations of air volume sampled. Twenty-four flights were completed. The payloads included the following: Nuclei Counter (4 flights), Small Impactor (4 flights), Sub-Micron Aerosol Collector (9 flights), Large Volume Impactor (4 flights), Indian Heavy Load Nuclear Emulsions (2 flights) and Indian High Altitude Nuclear Package (1 flight). The Sub-Micron Aerosol Collector (SMAC) along with the Indian Heavy Load Nuclear Emulsion were reflown on spare balloons because of earlier flight malfunctions to account for the total of 24 flights rather than the 22 planned. (Author)

AD-265 252 Div. 1, 9
(TIPSA/WAW) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
AERODYNAMIC CHARACTERISTICS OF A LARGE-SCALE MODEL WITH A HIGH DISK-LOADING LIFTING FAN MOUNTED IN THE FUSELAGE,
by Kiyoshi Aoyagi, David H. Hickey, and Richard A. deSavigny. Oct 61, 59p. incl. illus. tables (NASA Technical note no. D-775)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-775.

DESCRIPTORS: (*Vertical take-off planes, Aerodynamics, Stability, Stability (Longitudinal), Pressure, Lift, Drag, Moments, Model tests, Wind tunnel models.) (Stabilizers Horizontal tail surface), Flaps, Tails, Effectiveness.) (Shrouded propellers, Tests.) Downwash.

An investigation was conducted to determine the longitudinal characteristics during low-speed flight of a large-scale VTOL airplane model with a direct lifting fan enclosed in the fuselage. The model had a shoulder-mounted unswept wing of aspect ratio 5. The effects on longitudinal characteristics of fan operation, propulsion by means of deflecting the fan efflux, trailing-edge flap deflection, and horizontal-tail height were studied. The lifting-fan performance characteristics, three-component longitudinal characteristics, static-pressure distributions over some parts of the model, and downwash at the horizontal tail are included. (Author)

AD-265 390 Div. 1
(TIPSA/WAW) OTS price $3.60

Air Force Flight Test Center, Edwards Air Force Base, Calif.
T-38A FLAMEOUT EVALUATION,
by Robert W. Sudderth and Norris J. Hanks.
Sep 61, 32p. incl. illus. tables (AFFTC TR 61-48)
Unclassified report

DESCRIPTORS: (*Jet training planes, Training planes, Jet planes, Airplane landings, Flight testing.) (*Turbojet engines, Failure (Mechanics, Starting.) Hazards.

The results of a test program to develop a flameout emergency landing pattern for the T-38 aircraft are presented. This was accomplished by preliminary tests, actual double engine flameout landings, and control surface rate tests to verify the slow response rates noted during the deadstick landings. The results of these tests indicate that a deadstick landing is not advisable. It is recommended that a pilot eject from the aircraft rather an attempt a deadstick landing. If a deadstick landing capability is required, it is recommended that a battery powered hydraulic backup pump be incorporated in the aircraft and the flameout landing pattern developed during this program be used. Airstart capability in a double engine flameout condition is satisfacry. Aircraft systems operation is satisfactory for deadstick glides to suitable airstart altitudes or to a safe ejection area. (Author)

AD-265 481 Div. 1
(TIPSA/CDM) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
TAKE-OFF DISTANCES OF A SUPERSONIC TRANSPORT CONFIGURATION AS AFFECTED BY AIRPLANE ROTATION DURING THE TAKE-OFF RUN,
by Albert W. Hall. Oct 61; 21p. incl. illus. table (Technical note D-982)
Unclassified report

Also available from NASA, Wash., 25, D. C., as NASA Technical note D-982.

DESCRIPTORS: (*Take-off, *Supersonic planes, *Transport planes, Aerodynamic configurations.) (Pitch, Lift, Drag, Mathematical analysis, Flight speeds.)

An analytical study has been made to determine the effects of rotation speed, rotation angle, and rotation time on the take-off distance of a supersonic transport configuration. The take-off distances were also determined at various rotation speeds to show the effects of such configuration changes as wing loading, maximum lift coefficient, thrust-weight ratio, and induced drag. (Author)

2. ASTRONOMY, GEOPHYSICS AND GEOGRAPHY

AD-264 715 Div. 2, 25
(TIPSP/GW) OTS price $3.60

McGill U. (Canada).
WATER BALANCE AND HEAT FLUX OF THE ARCTIC OCEAN,
by E. Vowinckel and Svenn Orvig. Sep 61, 35p. incl. tables, 51 refs. (Arctic Meteorology Research Group Publication in Meteorology no. 44; Scientific rept. no. 1)
(Contract AF 19(604)7415)
(AFCRL-875) Unclassified report

DESCRIPTORS: (Oceans, *Sea water, *Heat transfer, Specific heat, Transport properties of Ocean currents.) (Heat production, Ice, Climatic factors, Arctic regions, Meteorological data.) (Thermodynamics, Oceans.) *Bibliography.

AD-264 754 Div. 2, 8
(TIPSE/DLW) OTS price $1.60

Research Labs. for the Engineering Sciences, U. of Virginia, Charlottesville.
STUDY OF STELLAR SCINTILLATION.
Quarterly progress rept. no. 5, 15 June-15 Sep 61, by E. C. Stevenson. Oct 61, 13p. incl. illus.
(Rept. no. EE-4437-105-61U)
(Contract DA 36-039-sc-85150)
Unclassified report

DESCRIPTORS: (*Radio astronomy, *Extraterrestrial radio waves, Stars, Wave transmission, Drift, Oscillation, Ionospheric disturbances, Ionosphere, *Ionospheric propagation, Measurement.) (Ionosphere models, Design.)

From the scintillation records taken at 4 receivers on an east-west line, the components of the apparent velocity of individual peaks of intensity of the ground pattern were computed for each of the 3 segments of the east-west path. Systematic accelerations were found which show that the ionospheric model for scintillation production should be re-examined and that drift velocities computed for the ground pattern may be due to local action in the ionospheric layer and not to transport of the layer. (Author)

AD-264 756 Div. 2
(TIPSP/GW) OTS price $2.60

Air Force Cambridge Research Labs., Bedford, Mass.
A YEAR'S STUDY OF THE INDEX OF IONOSPHERIC STORMINESS,
by H. S. Marsh, R. J. Cormier and others. 1961, 26p. incl. illus. (Rept. no. AFCRL 705)
(Proj. 5631)
Unclassified report

Reprint from Proceedings of the I.R.E. Fifth MILECON, National Convention on Military Electronics, Washington, D. C., 26-28 June 61.

DESCRIPTORS: (*Ionospheric disturbances, *Magnetic storms, Periodic variations, Diurnal variations, Intensity, Tables, Nomographs.)

Several related features of ionospheric storms were studied. Empirical laws were developed relating the intensity of a magnetic disturbance to the intensity of the accompanying ionospheric disturbance, (Concord Storm Index.) In addition, sharpness of rise or fall of the magnetic disturbance was related consistently, and numerically, with the following days' ionospheric storm history. Seasonal variations of ionospheric storm-related parameters, and detailed variations of these parameters during the vast storms around April 1960 were explained. Progress was reported in the study of the Concord Anomalies indicating that the puzzling twotone anomaly is probably due to a special case of unusually high-speed conventional Faraday rotation. (Author)

AD-264 774 Div. 2, 25, 15
(TIPSP/MFA) OTS price $1.60

Palmer Physical Lab., Princeton U., N. J.
ORBIT CALCULATIONS FOR THE 15 INCH HYDROGEN BUBBLE CHAMBER.
Technical rept. no. 27 on Cosmic Ray and Elementary Particles Group,
by Kenneth Edwards. 4 Oct 61, 14p. incl. illus.
(Contract Nonr-185806; In cooperation with Naval Ordnance Lab.)
Unclassified report

DESCRIPTORS: (Orbital flight paths of *Hydrogen, *Bubble chambers by *Computers, *Programming, Data, Particles in Magnetic fields.) (Motion, Equations, Differential equations, Integration.) Tables.

A program for computing orbits of charged particles in cylindrically symmetric magnetic fields is described. The program is written in Fortransit in use on the IBM 650 computer. It is adapted from a program written by G. Schrank and uses the Runge-Kutta method in solving differential equations as developed by Peskin and Rabinowitz. The equations of motion for a particle of charge e and mass m moving in a cylindrically symmetric static magnetic field are given. (Author)

AD-264 795 Div. 2, 25
(TIPSP/GW) OTS price $2.60

Space Technology Labs., Inc. Los Angeles, Calif.
ELECTROPHOTOMETRIC STUDIES OF THE LUMINESCENCE OF THE NIGHT SKY (Elektrofotometricheskie Issledovaniya Svetimosti Nochnogo Neba)
by S. F. Rodionov, tr. by Z. Jakubski, Oct 61, 21p. incl. illus. tables (Rept. no. STL-TR-61-5110-48, Trans. from Optika i Spektroskopiya, 2:606-615, 1957)
Unclassified report

DESCRIPTORS: (*Sky brightness of *Night sky, Twilight, *Luminescence, Measurement.) (Diurnal variations of Infrared radiation, Ultraviolet radiation, Recombination reactions, Exosphere, Excitation, Determination by Spectrophotometers, Photometers.) USSR, Translation.

Basic results are given of work performed in the photometry laboratory, from 1948 to the present, making use of electrophotometric methods developed in the laboratory. Diurnal variations of the infrared radiation of the night sky were detected. The energy distribution in the radiation spectrum of the night sky was measured in absolute units. Infrared radiation from the Milky Way was detected. Twilight flashes of radiation from the upper atmosphere in the visible and infrared spectral regions were detected and studied. Diurnal variations were detected in the

ultra-violet region of the radiation of the night sky, and the distribution of brightness of the night sky over the firmament was measured. A positive correlation was established between the infrared radiation of the night sky and solar activity. The infrared component of the radiation of the aurora polaris was measured. A general approach is proposed to the mechanism of excitation of the radiation of the night sky. This approach consists of accounting for the scattered short-wave ultraviolet light from the sun. This light is present in the upper layers, by night as well as by day, as a result of processes of anomalous refraction and secondary scattering. (Author)

AD-264 959 Div. 2, 6
(TIPSP/TL) OTS price $9.10

Marine Lab., U. of Miami, Coral Gables, Fla.
RADAR HURRICANE RESEARCH 1 JULY 1960 - 30 JUNE 1961.
Final rept.,
by H. V. Senn, H. W. Hiser and others. Aug 61, 96p. incl. illus. tables (Rept. no. 8858)
(Contract Cwb-9940)
Unclassified report

DESCRIPTORS: (*Hurricanes, Detection, *Meteorological radar, Hurricane tracking, Motion.) (Storms, Marine meteorology, Electronic equipment, Meteorological instruments.) (Radar recording cameras, Photographic film.) (Equations, Data.) Tables.

Assuming outward moving and undistorted hurricane spiral bands, equations are derived for echo motion within the confines of the bands. The validity of the equations and the functional dependence of K1 and K2, two quantities which are functions of the radial and tangential components of echo velocity at various ranges and quadrants of the hurricane, are investigated by the use of radarscope data from Debra 1959. Simultaneous photographs from 10 radars during Donna 1960 are analyzed with other PPI and RHI data in an attempt to show: (1) a comparison between what several individual radars in given quadrants of a storm might expect to see; (2) an analysis of the complete precipitation pattern of hurricane Donna on the 10th of September; and (3) the effectiveness of various land based and airborne radars in hurricane tracking and analysis from both theoretical and practical considerations. Suggestions for compensating for errors in airborne radar tracking of hurricanes are given along with recommendations for the use of radar photographic methods in reconnaissance and the establishment of a camera bank to enable good radar installations now without radarscope recording equipment to obtain it on a temporary basis as necessary. (Author)

AD-264 970 Div. 2
(TIPSP/GRW) OTS price $1.60

Geophysical Inst., U. of Alaska, College.
HIGH LATITUDE GEOPHYSICAL DATA FOR APRIL-JUNE 1961.
30 Sep 61, 14p. incl. tables (Rept. no. UAG-C-22)
Unclassified report

DESCRIPTORS: (*Geophysics, Cosmic rays) (Earth, Electric currents, Terrestrial magnetism.) (Noise (Radio), Ionospheric disturbances, Aurorae, Tables, Alaska.)

AD-264 991 Div. 2, 5, 8
(TIPSP/WH) OTS price $10.50

Geophysical Inst., U. of Alaska, College.
RIOMETER RECORDS OF 27.6 MC/S COSMIC NOISE FOR KING SALMON AND UNALASKA,
comp. by Harold Leinbach. June 61, 137p. incl. table (IGY Aurora (Instrumental) rept. no. 3)
Unclassified report

DESCRIPTORS: (*Extraterrestrial radio waves, *Cosmic ray bursts, Atmosphere, Arctic regions, Absorption, Aurorae, Solar disturbances, Magnetic storms.) (Cosmic rays, Cosmic ray bursts, Measurement, Radio receivers, *Radiometers, *Radiofrequency spectrum analyzers.) Ionosphere.

Records of the intensity of cosmic radio noise at 27.6 Mc/s were obtained during the International Geophysical Year at six stations in Alaska and at Thule, Greenland. The prime object was to measure the non-deviative absorption of radio waves in the polar ionosphere, particularly, the absorption associated with auroral and magnetic disturbances. (Author)

AD-265 005 Div. 2, 25
(TIPSP/MFA) OTS price $1.60

Maryland U., College Park.
ENERGY DISSIPATION OF SPIRALING PARTICLES IN THE POLAR ATMOSPHERE,
by K. Maeda and S. F. Singer. June 61, 19p. incl. illus. tables.
(Contract AF 19(604)3861)
(AFCRL-1015) Unclassified report

DESCRIPTORS: (*Magnetic fields, Terrestrial magnetism, *Particles in *Arctic regions, *Atmosphere in Helixes.) (Energy, Reduction of Protons, Elastic scattering, Electrons, Atomic spectrum, Atmosphere models.) (Equations, Integral equations.) Tables.

The magnetic field in the polar regions may be regarded as uniform and vertical to the earth's surface. Charged particles impinging into the atmosphere in these regions follow a spiral orbit along the magnetic line of force. Since the rates of energy loss of these particles are the same in all directions, the pitch angle, alpha, of these incident particles is constant till the end of the range of the particles. In other words, incident particles maintain spiral motions with constant pitch angles, while the radius of gyration decreases corresponding to the energy loss experienced by the particle with increasing atmospheric depth. (Author)

AD-265 026 Div. 2
(TIPSB/CW) OTS price $1.10

Air Weather Service, Scott Air Force Base, Ill.
AN OBJECTIVE METHOD OF FORECASTING GULF STRATUS AT WEBB AFB, TEXAS,
by Lawrence E. Tunnell. Aug 61, 4p. illus.
Unclassified report

DESCRIPTORS: (*Weather forecasting, Texas, Gulf of Mexico, *Stratus clouds, Meteorology.)

Almost the entire Texas area is confronted at times with the problem of stratus ceilings caused by moist air which moves up from the Gulf of Mexico. The objective is to determine a method for forecasting whether or not a stratus ceiling with bases of 2500 ft. or less

will occur at Webb between the hours of 0300C and 0900C, using data available at 0300C. It is emphasized that this study is concerned only with stratus which is caused by a tongue of moist air moving up from the Gulf of Mexico. It is not concerned with post-frontal stratus or other situations where stratus occurs. This study is at present being performed each day and will continue to be performed indefinitely. It is hoped that in addition to more data on the basic study, information can be obtained which will furnish a method of forecasting the height of the cloud bases and possibly a method of forecasting certain types of fog. (Author)

AD-265 036 Div. 2, 24
(TIPSP/MFA) OTS price $3.60

Geonautics, Inc., Washington, D. C.
PHOTOGRAMMETRIC FLASH TRIANGULATION FOR CORPS OF ENGINEERS FIELD USE.
Interim technical rept. no. 2, 1 Nov 60 to 31 Jan 61,
by Heinrich K. Eichhorn. 15 Feb 61, 35p. incl. illus.
(Contract DA 44-009-eng-4646, Proj. 8T35-12-001-01)
Unclassified report

DESCRIPTORS: (*Geodesics, *Aerial photography, *Mapping, Rockets, Rocket trajectories, Telescopes.) (Topographic cameras, Flash lamps, Time signals, Telemetering, Rocket flight, Rocket planes, Personnel, High altitude, Photographic equipment, Photographic plates, Optical instruments.) (Computers, Programming, Partial differential equations.) (Trigonometry, Matrix algebra, Tables.)

Preliminary equipment and operational requirements for a photogrammetric flash triangulation system for Army use in extending geodetic control over short and medium distances are presented. The field instrumentation system under consideration for Army application is based on the use of an equatorially mounted camera for obtaining the observations during a guided photograph of the star background. Existing equipment which could be used in system is discussed, and equations which are being programmed for an error analysis of the system are presented. (Author)

AD-265 049 Div. 2
(TIPSP/MFA) OTS price $2.60

Army Map Service, Washington, D. C.
TOPOGRAPHIC LUNAR MAPPING AT THE ARMY MAP SERVICE,
by Albert L. Nowicki. Sep 61, 25p. incl. illus.
(AMS Technical rept. no. 37)
Unclassified report

DESCRIPTORS: (*Terrain, *Mapping of Aerial photography, *Moon by Stereoscopic projectors, Stereoscopic map plotters, Astronomical data, Photography, Photographic equipment, Stereoscopes, Television cameras, Astronomical observatories, Photographs.)

With the advent of the space age and subsequent studies suggesting the possibility of landings on the moon the requirements for a topographic lunar map became apparent. This report describes the steps taken by the Army Map Service, Corps of Engineers, U. S. Army, to prepare such a map, in two sheets, of the visible surface at a scale of 1:5,000,000 with 1000-meter contours (plus 500-meter auxiliary contours) on a modified stereographic projection. (Author)

AD-265 060 Div. 2
(TIPSB/LH) OTS price $2.60

Army Cold Regions Research and Engineering Lab., Wilmette, Ill.
CLIMATOLOGICAL MEANS AND EXTREMES ON THE GREENLAND ICE SHEET,
by L. J. Haywood and J. B. Holleyman. Apr 61, 27p. incl. illus. tables (Research rept. no. 78)
Unclassified report

DESCRIPTORS: (*Greenland, Climatic factors, Meteorological data.)

The study is based on available temperature, wind, and precipitation records for 12 stations on the Greenland Ice Sheet for varying periods dating back to 1930. The means of the climatological parameters studied are tabulated, including mean and extreme temperatures for the period of record at each station, the frequency distribution of wind speed and direction, and the precipitation, accumulation, and number of days with snowfall. A climatological map is included which presents a cartographic picture of the over-all climatology of the Ice Sheet. (Author)

AD-265 095 Div. 2, 30
(TIPSB/CCH) OTS price $2.60

Hydraulic Engineering Lab., U. of Calif., Berkeley.
FLOATING BREAKWATER SURVEY SUMMER AND FALL, 1960,
by H. W. Shen. June 61, 23p. incl. illus. tables.
(Series no. 140, Issue no. 4)
(Contract NBy-3139)
Unclassified report

DESCRIPTORS: (*Model basins, Floating docks, *Breakwaters, *Mooring, Experimental data.) (Naval research laboratories, *Hydrology.)

AD-265 096 Div. 2, 33
(TIPSB/CCH) OTS price $1.10

Hydraulic Engineering Lab., U. of Calif., Berkeley.
CLOSELY SPACED PILES AS A BREAKWATER,
by R. L. Wiegel. May 61, 4p. incl. illus.
(Series no. 140, Issue no. 6)
(Contract NBy-3139)
Unclassified report

DESCRIPTORS: (*Piers as *Breakwaters from Wave transmission, Mathematical analysis, Construction, Theory.) (Damping by *Water waves.) Hydrology.

AD-265 097 Div. 2, 30
(TIPSB/MS) OTS price $5.60

Hydraulic Engineering Lab., U. of Calif., Berkeley.
HOVERING BREAKWATER.
Final rept.,
by R. L. Wiegel, H. W. Shen, and J. D. Cumming. June 61, 56p. incl. illus. tables (Series no. 140, Issue no. 5)
(Contract NBy-3139)
Unclassified report

DESCRIPTORS: (*Breakwaters, Configuration, Design, Effectiveness.) (Water waves, Control.)

A bag filled with water that hovered with its top just afloat was tested in both the laboratory and in San Francisco Bay. It appeared to be a more effective breakwater for wind waves which were at their limit of stability (whitecaps) which were encountered in the bay than for swell type waves of the laboratory. The mechanism, or mechanisms, by which the breakwater attenuated the waves was not determined, although it behaved in part as a nonlinear mechanism. (Author)

AD-265 125 Div. 2, 8
(TIPSP/MFA) OTS price $3.60

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
BRIGHTNESS DISTRIBUTION IN DISCRETE RADIO SOURCES. I. OBSERVATIONS WITH AN EAST-WEST INTERFEROMETER,
by Alan T. Moffet. 1961, 38p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (Astronomy, *Radio astronomy, *Interferometers, Radio interferometers, *Amplitude modulation, Radiofrequency spectrum analyzers, Visibility, Functional analysis, Integral transforms, Astronomical data, Tables.)

The Caltech variable baseline interferometer has been used in a program of brightness distribution measurements on 195 discrete radio sources at a wavelength of 31.3 cm. This paper reports measurements, made with an east-west interferometer baseline, of the complex visibility functions of 127 sources. The amplitude and phase of the visibility function were measured at transit with antenna spacings of 195 lambda, 389 lambda, 779 lambda, and 1557 lambda. Using these same basic spacings and by observing at large hour angles, the visibility amplitude was measured at ten other effective spacings between 126 lambda and 1363 lambda. Not all sources were observed at all spacings. The data are presented in tabular form, and graphs of the visibility amplitude as a function of antenna spacing are given for 51 of the more interesting sources. The interpretation of these data in terms of source brightness distributions will be given in another paper (AD-265 126). (Author)

AD-265 126 Div. 2, 8
(TIPSP/MFA) OTS price $1.60

Radio Observatory, Calif. Inst. of Tech., Owens Valley, Calif.
BRIGHTNESS DISTRIBUTION IN DISCRETE RADIO SOURCES. II. OBSERVATIONS WITH A NORTH-SOUTH INTERFEROMETER,
by P. Maltby. 1961, 20p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (Astronomy, *Radio astronomy, *Interferometers, Radio interferometers, Radiofrequency spectrum analyzers, Extraterrestrial waves, Radio signals, Tables, Visibility, *Amplitude modulation.)

Information about the brightness distribution in 165 radio sources has been obtained at a wavelength of 31.3 cm. The measurements were made with the variable spacing interferometer at the Owens Valley Radio Observatory using a north-south baseline. Primary sets of observations, giving the visibility amplitude and the phase, were taken at transit at four different antenna spacings. Additional information about the brightness distribution was obtained from observations at large hour angles, using the same physical antenna separations. The results of the observations are given in tabular form and several visibility curves are shown. (Author)

AD-265 127 Div. 2, 8
(TIPSP/WH) OTS price $3.60

Radio Observatory, Calif. Inst. of Tech., Owens Valley, Calif.
THE RADIO SPECTRUM OF SUPERNOVA REMNANTS,
by D. E. Harris. 1961, 32p. incl. illus. tables, 28 refs.
Unclassified report

DESCRIPTORS: (Astronomy, *Radio astronomy, Stars, Galaxies, *Supernovae.) (Extraterrestrial radio waves, Radiofrequency spectrum analyzers, *Microwave spectroscopy.)

Observations of thirteen galactic sources at 960 mc generally assumed to be supernova remnants, are coupled with previous observations at other frequencies to derive spectral indices. Although several values of spectral index are found in the neighborhood of zero, arguments are presented that free-free transitions are not the primary cause of the radio emission. An interpretation of the relatively large range of spectral indices is suggested on the basis of an evolutionary sequence in which young, bright objects with relatively steep spectra gradually evolve into old, faint objects with flat or inverted spectra. (Author)

AD-265 139 Div. 2, 25
(TIPSP/MFA) OTS price $3.60

Eppley Lab., Inc., Newport, R. I.
A NEW APPROACH TO THE MEASUREMENT OF TERRESTRIAL RADIATION.
Final rept.,
by A. J. Drummond. July 61, 32p. incl. illus.
(Contract AF 19(604)5888)
(AFCRL-828) Unclassified report

DESCRIPTORS: (Instrumentation and Measurement of *Terrain, *Blackbody radiation.) (Laboratory equipment, Albedo, Radiometers, Potentiometers, Atmosphere, Tests, Thermopiles, Spectrophotometers, Wiring diagrams.) Thermal radiation.

An instrument has been designed for the measurement of terrestrial radiation, and especially for the isolation of the upward or downward component during daytime conditions. The essential principle is the differential signal generated by opposed thermopile detectors. One sensing unit responds to radiation of wavelength from 0.57 to about 30 microns; the wavelength response of the other sensor is from 0.53 to about 3 microns. The sensitivity of the latter can be adjusted so that only the signal for the region from 3 to 30 microns is accepted. A detailed discussion of the physical principles involved in the interpretation of such measurements is included as is also a summary account of the basic calibration and operation procedures. (Author)

AD-265 141 Div. 2, 5, 30
(TIPSP/WH) OTS price $8.10

Electromagnetic Research Corp., College Park, Md.
PROJECT NEPTUNE - INVESTIGATION OF THE COMMUNICATIONS POTENTIALITIES OF THE TRADE WIND INVERSION DUCT.
Final rept.,
by E. A. Bondurant, J. C. Katzin and others.
15 Aug 61, 90p. incl. illus. tables (Rept. no. CRC-7435-1)
(Contract AF 19(604)7435)
(AFCRL-769) Unclassified report

DESCRIPTORS: (*Radio communication systems, Electromagnetic waves, Propagation, Radio signals, Radio transmission, *Wind, Ducts.) (*Meteorology, *Meteorological data, Radiosondes, Atmospheric sounding, Atlantic Ocean.) (Aircraft, Meteorological instruments, Instrumentation.)

The communications potentialities of the trade wind inversion duct were explored by means of air-to-air and air-to-ground propagation loss measurements. These measurements were made in the trade wind regions of the North Atlantic and South Atlantic, as well as between the two regions. A meteorological analysis of radiosonde data for Puerto Rico and Dakar, Senegal in the North Atlantic was made prior to measurements in that area, to serve as a guide in carrying out the experimental program, and the results are shown. Flights were made between Recife, Brazil, Ascension Island, and Luanda, Angola in the South Atlantic, and between Recife and Dakar for cross coupling measurements. The report describes the objectives, project planning, the instrumentation of the two P2V-5 aircraft used in the program, the operational program carried out, and gives some sample results of the measurements. Detailed analysis of the data accumulated is to be carried out under a later contract. (Author)

AD-265 148 Div. 2, 24
(TIPSP/MFA) OTS price $3.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
RESEARCH IN SURVEYING, MAPPING, AND GEODESY.
Quarterly rept. no. 6, 4 Sep 60-3 Mar 61,
by D. L. Birx, J. K. Gleim and others. 3 Mar 61, 34p. incl. illus. tables, 36 refs. (Rept. no. Q-A2217-6)
(Contract DA 44-009-eng-3767, Proj. 8T35-12-001-01)
Unclassified report

DESCRIPTORS: (*Geodesics, Aerial photography, *Mapping, Astronomical data, Satellite vehicles, Refraction, Doppler tracking, Doppler navigation, Doppler systems.) (Atmospheric refraction, Refractive index, Telescopes, Orbital flight paths, Atmosphere, Rocket flight, Astronomical observatory, Atmosphere models.) (Integration, Tables, *Bibliography.)

This report presents the methodology and computations for calculating astronomical refraction through an atmosphere of known structure. It gives several examples of the application of this technique using the 1959 ARDC model atmosphere, and compares the results obtained with both the Willis and Pulkovo tables. The report also presents a detailed discussion of the use of doppler tracking systems for geodetic measurements through the medium of a man-made earth satellite. (Author)

AD-265 165 Div. 2, 8
(TIPSW/DLW) OTS price $10.10

General Electric Co., Syracuse, N. Y.
RADC TRINIDAD TEST SITE. VOLUME IV. A STUDY OF IONOSPHERIC AND LUNAR CHARACTERISTICS BY RADAR TECHNIQUES.
Quarterly technical note on Phase 1.
31 Oct 60, 126p. incl. illus. tables, 57 refs.
(Contract AF 30(602)2244)
(RADC TN 61-140) Unclassified report

DESCRIPTORS: (*Radio astronomy, Moon, *Radar reflections, Electromagnetic wave reflections, Radar echo areas, Radar signals, L band, Ultra high frequency, Surface area, Measurement.) (*Ionosphere, Electrons, Radio waves, Diurnal variations, Electromagnetic waves, Ionosphere propagation, Scattering, Wave transmission, Magneto-optic rotation, Polarization, Measurement.)

The analytical results of the radar-lunar measurements conducted at the U. S. Air Force Trinidad Test Site, WIF, (107.7 degrees N, 61.6 degrees W) during the period between January and July 1960 are reported. The objectives of the experimental program were to determine: (1) the diurnal and also seasonal variation of the electron content in the ionosphere, and (2) the reflectivity characteristics of the moon's surface. Transmissions were made at a frequency of approximately 425 mc utilizing linear (horizontal) polarization while the reflected lunar signals were simultaneously received on both the transmitted and orthogonal polarizations. The moon was automatically tracked from moonrise to moonset on 2 of the experimental measurements while partial lunar orbits were observed on 4 other occasions. The date of observation of one of the partial lunar orbits corresponded to the time when the moon was at its maximum southern declination. The remaining 5 observations were conducted during the time when the moon was at its maximum northern declination. (Author)

AD-265 171 Div. 2, 16, 32
(TIPSB/CW) OTS price $6.60

Air Force Cambridge Research Labs., Bedford, Mass.
BIBLIOGRAPHY OF LUNAR AND PLANETARY RESEARCH - 1960 (WITH ANNOTATIONS),
by John W. Salisbury and Lynne T. Salisbury.
July 61, 61p. (GRD Research notes no. 62; AFCRL-684)
Unclassified report

DESCRIPTORS: (*Moon, *Planets, *Meteors, Meteorites, Biology, *Bibliography.) Scientific research, Space medicine.

A checklist of lunar and planetary research articles published in 1960 is provided plus a convenient starting place for a literature search on Astrobiology, Meteors and Meteorites, Moon, Origin of the Solar System, Planets, and Tektites. In some cases, articles published in 1959 have been included to present a more well-rounded reference list. (Author)

AD-265 172 Div. 2, 1
(TIPSP/WH) OTS price $3.60

Air Force Cambridge Research Labs., Bedford, Mass.
FLIGHT INFORMATION AND EXPERIMENTAL RESULTS OF

INFLATABLE FALLING SPHERE SYSTEM FOR MEASURING UPPER AIR DENSITY,
by G. A. Faucher, R. W. Procunier, and C. N. Stark. Aug 61, 37p. incl. illus. (GRD Research notes no. 63; AFCRL-685)
Unclassified report

DESCRIPTORS: (*Balloons, Meteorological balloons, Spheres, Pneumatic devices, *Air, Drag, Density, *Upper atmosphere.) (Balloons, Instrumentation, Accelerometers, Telemetering systems.) (*Atmospheric sounding, Meteorological instruments, Sounding rockets.)

A Nike-Cajun rocket firing for the purpose of ejecting an inflatable sphere with accelerometers and telemetry at 300,000 ft is described. The firing was to measure the drag acceleration of the sphere above 300,000 ft for use in calculating air-density measurements. The drag acceleration is measured with three linear accelerometers which measure acceleration along three mutually perpendicular axes from within the sphere. The density calculated from this flight was 1.46 x 10 to the -9th power slugs/cubic ft at 107 km. A secondary objective was to obtain an engineering evaluation of a system to eject and inflate a 9-ft diameter sphere. Flight records indicated that the sphere was ejected 76 sec (300,000 ft) after launching. The rocket was fired shortly after sunset when the sky had darkened and the earth's shadow extended to about 250,000 ft. The sphere was observed for approximately 3 minutes. The sphere attained an altitude of 450,000 ft. Telemetry data was recorded for 12 minutes. (Author)

AD-265 174 Div. 2, 20
(TIPSP/WH) OTS price $3.60

Air Force Cambridge Research Labs., Bedford, Mass.
METEOROLOGICAL EVALUATION AND APPLICATION OF RAINFALL RADIOACTIVITY DATA,
by Per B. Storebo. Aug 61, 36p. incl. illus. tables (GRD Research notes no. 65; AFCRL-811)
(In cooperation with Norwegian Defence Research Establishment, Kjeller pr Lillestrom, Norway)
Unclassified report

DESCRIPTORS: (*Radioactive fall-out, Raindrops, *Precipitation, Atmosphere, Barium, Strontium, Radioactive isotopes, Radioactive decay.) (Radioactivity, Air mass analysis, Meteorological data, *Meteorology.)

The meteorological analysis of weather situations during which radioactive samples were collected is described and the limitations of interpretation are discussed. It is shown that precipitation washes out a significant part of the radioactive particles in the air. Successive samples from weather systems revealed that when precipitation was produced in the warm air mass only, the radioactivity in precipitation decreased with time and was independent of location. To explain this, a new weather system model is proposed in which the main part of the precipitation is produced by uniform lifting of a warm air tongue. (Author)

AD-265 255 Div. 2, 25, 12
(TIPSP/WH) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
EARTH REFLECTED SOLAR RADIATION INPUT TO SPHERICAL SATELLITES.
by F. G. Cunningham. Oct 61, 9p. incl. illus. (Technical note no. D-1099)
Unclassified report

Also available from NASA. Wash. 25, D. C., as NASA Technical note D-1099.

DESCRIPTORS: (*Satellite vehicles, Spheres, Temperature.) (*Solar energy, Solar spectrum, Thermal radiation, Reflection from Earth, *Albedo (Astronomy).) (Heat, Absorption, Satellite vehicles.) Geophysics.

A general calculation is given of the earth's albedo input to a spherical satellite, with the assumption that the earth can be considered a diffusely reflecting sphere. The results are presented in general form so that appropriate values for the solar constant and albedo of the earth can be used as more accurate values become available. The results are also presented graphically; the incident power is determined on the assumption that the mean solar constant is 1,353,000 ergs per sq cm per sec and the albedo of the earth is 0.34. (Author)

AD-265 258 Div. 2
(TIPSP/GW) OTS price $6.60

New York U. Coll. of Engineering, N. Y.
LOCAL WIND CIRCULATIONS.
Quarterly progress rept. no. 4, 1 Apr-30 June 61, on Wind Turbulence in the Lee of a Low Conical Mountain,
by James Halitsky. 30 June 61, 69p. incl. illus. tables.
(Contract DA 36-039-sc-84939, Proj. 3A99-07-001-03)
Unclassified report

DESCRIPTORS: (Atmosphere, *Wind, *Mountains, Turbulence, Wake, Fluid mechanics.) (Hydrodynamics, Gas flow, *Terrain models, New York, Tables.)

Experiments performed at Bear Mountain provide data from which the fields of mean flow and turbulence near the ground in the lee of the mountain were delineated. A model of the wind structure was developed which agrees well with the observed data. The model is useful in understanding the mechanism which generates the observed turbulence and in isolating turbulence phenomena attributable only to the mountain from turbulence generated by adjacent mountains. Comparison of observed data with flow around flat plates in a wind tunnel indicates the possibility of a region of high turbulence above and downwind of the mountain top. (Author)

AD-265 278 Div. 2
(TIPSP/MFA) OTS price $1.10

Pennsylvania State U. Coll. of Mineral Industries, University Park.
MODEL STUDIES OF SEISMIC ENERGY DISTRIBUTION AROUND DIFFERENT TYPES OF SOURCE.
Quarterly rept. no. 1,
by B. F. Howell, Jr. 30 Nov 60, 6p. incl. illus.
(Contract AF 19(604)7383)
Unclassified report

DESCRIPTORS: (*Seismic waves, *Earth models, Tests, Experimental data, Disks, Piezoelectric crystals, Deformation, Energy, Laboratory equipment, Shear stresses, Compression shock.)

Experiments to compare, through the use of models, the seismic pulses to be expected around different types of energy sources such as a fault displacement or an explosion are described. They are intended not only to observe the differences in the pulses generated at the source but also the effects of structure in the regions surrounding the source. In this way it is hoped that a better insight will be obtained into the differences which may be expected between seismic waves recorded from natural and artificial sources. (Author)

AD-265 317 Div. 2, 6
(TIPSB/CW) OTS price $2.60

United Research, Inc., Cambridge, Mass.
TURBULENCE MEASUREMENTS AT HIGH ALTITUDES BY SECOND-DIFFERENCE INTERFEROMETRY.
Quarterly rept. no. 4, 1 Apr-30 June 61,
by Dwight W. Battean and Thomas E. Beling.
30 June 61, 21p. incl. illus.
(Contract DA 36-039-sc-84963)
Unclassified report

DESCRIPTORS: (*Turbulence, Measurement, High altitude, *Atmosphere, Stratosphere.) (*Radar tracking, Radar targets, *Radio interferometers, Phase detectors, Phase measurement.) (Radar reflectors, Parabolic antennas, Dipole antennas.)

A brief statement of contract objectives and current status are given. A simplified analysis is given leading to a simple formula which is useful for analyzing data. This formula is suitable for hand computation in the two target case, but, with a multiplicity of targets, data must be further processed before useful results are obtained. Modifications to receiving systems are described. Results of a fully instrumented two-target test are described. (Author)

AD-265 370 Div. 2
(TIPSP/MFA) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
RELATIVISTIC EFFECTS IN ASTRONAUTICS.
by S. M. Rytov. 14 Sep 61, 2p. (Trans. from Some Relativistic Phenomena in Astronavigation in Vsesoyuznoye Obshchestvo Po Rasprostraneniyu Politicheskikh I Nauchnykh Znaniy. Novyye Problemy Fiziki, Sbornik Statey; New Problems of Physics, Collection of Articles; Moskva, Znaniye, pp. 3-45, 1961) (AID Rept. no. 61-131)
Unclassified report

DESCRIPTORS: (*Relativity theory, Astronomical data, *Astronautics, Space navigation, Satellite vehicles, Spaceships, Stars, Interstellar matter, Meteors, Galaxies, Rare gases, Space environmental conditions.) (Particles, Blackbody radiation, Energy, Nucleons, Cosmic rays, Motion, Groups (Mathematics).) (Translations, USSR.)

Three effects are discussed which would arise in vehicles traveling with relativistic velocities: (1) apparent change in position and appearance of stars for the relativistic observer, (2) change in the appearance of a star being passed by a relativistically fast vehicle at a close distance, and (3) effect of the interstellar medium (micrometeorites, galactic dust, and highly rarefied interstellar gas, mostly hydrogen) on the relativistic vehicle and crew. (Author)

AD-265 391 Div. 2, 22
(TIPSP/MFA) OTS price $1.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
EMPIRICAL COMPARISONS OF METEOROLOGICAL ROCKET WIND SENSORS,
by Kenneth R. Jenkins. Oct 61, 18p. incl illus.
(Technical rept. no. 111)
Unclassified report

DESCRIPTORS: (Ionosphere, *Meteorological data *Rockets, Wind, *Atmospheric sounding, Instrumentation, Meteorological balloons, Radar confusion reflectors, Parachutes, Radiosondes, Atmosphere.)

Graphical comparisons of the wind responses of several meteorological rocket sensors are presented to demonstrate the applicability of the contemporary systems the problem of measuring winds at altitudes in excess of those attainable by normal balloon techniques. Data are presented for component winds derived from chaff, parachutes, spheres, and standard radiosondes. To avoid masking the basic data, response corrections have not been applied. These data indicate that the parachute and sphere provide a generally acceptable accuracy to 200,000 feet without application of fall-rate corrections, while optimized chaff is expected to provide acceptable data to 250,000 feet. (Author)

AD-265 402 Div. 2, 25
(TIPSP/GW) OTS price $6.60

Hawaii Inst. of Geophysics, Honolulu.
OPTICAL ASTRONOMICAL SEEING. A REVIEW,
by Mark H. Wimbush. May 61, 56p. 220 refs.
(Scientific rept. no. 1; Rept. no. 16)
(Contract AF 19(604)2292)
(AFCRL-697) Unclassified report

DESCRIPTORS: (Stars, Astronomy, *Astronomical data, Astronomical cameras, Telescopes, *Interference by Atmosphere, Turbulence, Interstellar matter.) (Sensitivity, *Optical images, Optics.)

Certain optical disturbances which hinder astronomical work are ascribed to turbulence in the earth's atmosphere and are designated seeing effects. These effects are described and classified, and from empirical observations their relations to various parameters, including atmospheric conditions, are discussed. It is shown that the available data can be accounted for by supposing that while the turbulence responsible for seeing effects is present throughout the lower part, at least, of the earth's atmosphere, it is particularly strong in certain layers. Typically, there are two of these layers--one near the ground and the other near the tropopause. Particulars are given of two important applications: (1) the selection of a site for an astronomical observatory, and (2) the design of telescope and observatory to minimize local air turbulence and so minimize image motion. Methods of measuring astronomical seeing and devices to reduce its harmful effects are described. (Author)

AD-265 411 Div. 2
(TIPSP/TL) OTS price $2.60

Minnesota U. School of Physics, Minneapolis.
ATMOSPHERIC OZONE.
Rept. on Atmospheric Physics Program,
by E. P. Ney and J. L. Kroening. Aug 61, 24p.
incl. illus. (Technical rept. no. AP-18)
(Contract Nonr-71022)
Unclassified report

DESCRIPTORS: (*Ozone, *Atmosphere, Physical properties, Molecules, Stratosphere, Height finding, Balloons, Flight paths, *Meteorological balloons, High altitude.) (*Meteorology, Meteorological data, Photochemical reactions, Luminescence.) (*Detectors, Test, Instrumentation, Measurement, Temperature inversion, Diurnal variations, Turbulence, Atoms, Temperature, Thermal conductivity.)

Contents:
The Diurnal Variation of Ozone at Minneapolis, Minnesota
The Strength of the Ozone Sink at the Ground
Transport of Ozone in the Atmosphere
Ozone ''Rivers'': Fine structure of the Ozone in the Upper Troposphere and the Lower Stratosphere

AD-265 437 Div. 2
(TIPSB/LH) OTS price $8.10

Library Services Section, Air Information Div., Washington, D. C.
SOVIET SEISMOLOGY AND SEISMOMETRY. A PRELIMINARY BIBLIOGRAPHY.
5 Sep 61, 81p. (AID rept. no. 61-135)
Unclassified report

DESCRIPTORS: (*Bibliography, USSR, Scientific reports, *Earthquakes, Seismographs, *Seismic waves.)

AD-265 439 Div. 2, 25
(TIPSB/CW) OTS price $3.60

Science and Tech. Section, Air Information Div., Washington, D. C.
PHENOMENA IN THE UPPER ATMOSPHERE. REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 17 for Sep 61.
30 Sep 61, 33p. (AID rept. no. 61-137)
Unclassified report

DESCRIPTORS: (*Bibliography of *USSR, *Astrophysics, *Geophysics, Ionosphere, Van Allen radiation belt, Cosmic rays, Solar atmosphere, Upper atmosphere, Meteorology.)

AD-265 490 Div. 2, 8, 12
(TIPSP/GW) OTS price $2.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
ON THE EVALUATION OF ELECTRON DENSITY DISTRIBUTION IN THE OUTER IONOSPHERE BY SATELLITE RADIO SIGNALS,
by H. Unz. 21 Aug 61, 22p. (Scientific rept. no. 7; Rept. no. 1116-11)
(Contract AF 19(604)7270)
(AFCRL-783) Unclassified report

DESCRIPTORS: (Determination of *Electrons, Density in *Ionosphere by Radio transmitters.) (Telemetering data from Satellite vehicles, Orbital flight paths, Radiofrequency, *Radio signals, Wave transmission, Satellite vehicle antennas.)

A new method is suggested for the evaluation of the electron density profile in the outer ionosphere above the F2 layer maximum. It is proposed that the satellite will carry a sweep-frequency transmitter, for frequencies above the maximum plasma frequency of the F2 layer. An analytical method is suggested by which the electron density profile above maximum F2 layer could be found from the time delay records at the ground station and the electron density profile below the maximum F2 layer. In the analysis it is assumed that corrections due to satellite orbit have been made, and that the static geomagnetic field is homogeneous in the region. (Author)

AD-265 491 Div. 2, 25
(TIPSP/MFA) OTS price $1.60

Antenna Lab., Ohio State U., Research Foundation, Columbus.
SIMPLIFIED ANALYSIS OF IONOSPHERIC h'(f) RECORDS, USING WAVE REFRACTIVE INDEX,
by H. Unz. 23 Aug 61, 16p. (Scientific rept. no. 8; Rept. no. 1116-12)
(Contract AF 19(604)7270)
(AFCRL-784) Unclassified report

DESCRIPTORS: (*Ionosphere, Refraction, Electromagnetic waves, *Wave analysis, *Refractive index, Magnetic fields, Plasma physics, Frequency.) (Equations, Functions, Integral equations, Partial differential equations, Integration.)

A new simplified method for the analysis of the ionospheric h'(f) records is developed, using the wave refractive index instead of the group refractive index. The average virtual height curves are the required experimental data for this method. The new simplified integral equation applies for the ordinary and the extraordinary waves. The final solution involves expansions of the functions in power series. (Author)

3. CHEMICAL WARFARE EQUIPMENT AND MATERIALS

AD-264 902 Div. 3, 30
(TIPSM/EJH) OTS price $1.60

Clarkson Coll. of Tech., Potsdam, N. Y.
A LIGHT SCATTERING INVESTIGATION OF COATED AEROSOLS.
Final rept. 1 Sep 58-31 Aug 61,
by Milton Kerker. 30 Sep 61, 17p. incl. tables.
(Contract DA 18-108-405-cml-201)
Unclassified report

DESCRIPTORS: (*Aerosols, *Silver compounds, *Chlorides or *Linolenic acid, Organic coatings, Particles, Volume, Measurement, Preparation, Nucleation.) (Coatings, *Organic coatings, Linolenic acid.) (Test methods, *Light, *Scattering.) (Test equipment, Electron microscopes, Photometers.) *Aerosol generators, Spheres.

The report summarizes the work accomplished including experiments on determination of size distribution of linolenic and silver chloride aerosols from light scattering and electron microscopy. Experiments with coated aerosols, i.e., silver chloride spheres coated with linolenic acid are being continued. The detailed results have been published and the references are given. (Author)

AD-264 961 Div. 3
(TIPSM/EJH) OTS price $5.60

General Mills Inc., Minneapolis, Minn.
FUNDAMENTAL STUDIES OF THE DISPERSIBILITY OF POWERED MATERIALS.
Quarterly progress rept. no. 5, 3 June-3 Sep 61, by J. H. Nash, G. G. Leiter, and A. P. Johnson. 30 Sep 61, 49p. incl. illus. tables (GMI rept. no. 2229)
(Contract DA 18-108-405-cml-824)
Unclassified report

DESCRIPTORS: (*Aerosols, *Particles, Powders, Organic compounds, Additives, Scattering, Diffusion, Theory.) (Powders, *Saccharides or *Ethylenes, *Glycols or *Stearates, Pressure, Density, Humidity, Mechanical properties, Electrostatics.) Test methods, Test equipment.

A technique is described for studying the manner in which local bulk density of a column of powder compressed in a cylinder varies with distance from the compressing piston. Measurements were made on each of the 3 base powders (saccharin, Carbowax 6000 and Span 60). The effect of humidity on properties of the three base powders was investigated by conducting a series of tests including shear strength, disc-lifting, aerosol decay and electrostatic charge analysis on powder samples. Fourteen different deagglomerant agents were evaluated by measuring their shear strength at a compressive load of 5305 dynes/sq cm. Cab-O-Sil had the lowest shear strength of all the agents tested. (Author)

AD-264 993 Div. 3, 16
(TIPSB/LH) OTS price $18.50

Colorado U. Medical Center, Denver.
THE DIAGNOSTIC SIGNIFICANCE OF THE RED CELL CHOLINESTERASE IN VARIOUS TYPES OF BLOOD DYSCRASIAS,
Semi-Annual progress rept. for Mar-Nov 59 on supplement no. 4,
by Joseph H. Holmes, Fred Hein, and Prawase Wasi. Nov 59, 296p. incl. illus.
(Contract DA 18-108-405-cml-264)
Unclassified report

DESCRIPTORS: (*Chemical warfare agents, Poisonous gases, *Blood, Blood plasma, *Pathology, Hematology, *Cholinesterase, Inhibition, Determination.)

Exposure to anticholinesterase agents reduced both the red cell and the plasma cholinesterase values. It required approximately 100-120 days for complete restoration to normal of the red cell cholinesterase when this had dropped to zero values. Curves indicating this were presented for single exposures and for patient groups. Repeated hemorrhage in normal persons will cause an increase in both reticulocyte count and red cell cholinesterase. It will also produce a decrease in the plasma cholinesterase value. Even though there was a drop in the reticulocyte count the elevated red cell cholinesterase may persist and thus be indicative of increased erythropoietic activity. (Author)

AD-265 314 Div. 3, 14, 26
(TIPSM/EET) OTS price $1.60

Stanford Research Inst., Menlo Park, Calif.
ENCAPSULATED AEROSOLS.
Quarterly progress rept. no. 6, 1 July-30 Sep 61, by Robert C. Robbins. 31 Oct 61, 12p. incl. illus. tables.
(Contract DA 18-108-405-cml-746)
Unclassified report

DESCRIPTORS: (Chemical warfare agents, *Aerosols, *Encapsulation, Coatings on Drops of Liquids.) (Encapsulation of Butyl radicals, Phosphites by Methanes, Waxes, Rubber, Ethylenes, Polymers.) (Aerosol generators, Design, Effectiveness.)

A two-stage microcapsule generator has been utilized to produce a variety of liquid core microcapsules. A number of operational and design changes have been made to improve the performance of the generator and to increase its versatility. The generator has been used to provide microcapsules of dibutyl phosphite in rubber, dibutyl phosphite in paraffin, and dibutyl phosphite in polyethylene. Studies were made of the effect of film coating on the evaporation rate of dibutyl phosphite microdroplets. An investigation was made of the effect of solution concentration on coat thickness in spray-dried microcapsules. Nozzle design was found to be a critical parameter. (Author)

AD-265 406 Div. 3, 29
(TIPSB/CCH) OTS price $1.10

Hughes Aircraft Co., Culver City, Calif.
FEASIBILITY AND DESIGN STUDY FOR COLLECTIVE PROTECTION EQUIPMENT FOR THE AN/MSG-4 SYSTEM.
Monthly progress rept. 1 Sep-1 Oct 61, by K. M. Spradlin. 21 Oct 61, 8p. incl. illus.
(GSG rept. no. 1610.30/159; SD 61-175)
(Contract DA 18-108-cml-6618)
Unclassified report

DESCRIPTORS: (*Particulate filters for Air, Purification, Chemical warfare agents, Biological warfare agents, *Radiological contamination, Inhibition, Aerosols, Poisonous gases, Pressure, Control.) Shelters, Vehicles, Ventilation.

The purpose of this study is to evaluate e feasibility of installing collective protection (air filtration) equipment on semitrailer vans, trucks, and air transportable shelters that contain the various subsystems of the AN/MSG-4 Antiaircraft Defense System. The collective protection equipment will include: a chemical, bacteriological, and radiological (CBR) filr for filtering irritating, noxious, and toxic gases and aerosols from the air; a pressure-control device to maintain minimum pressure of the air conditioning system; and an air lock that permits personnel to make safe entry and exit from the various vehicles and shelters. Mockups of proposed CBR filters and a mockup of a protective entrance will be fabricated following completion of the initial phase of the feasibility study. (Author)

4. CHEMISTRY

AD-264 700 Div. 4
(TIPSM/EJH) OTS price $2.60

Gibbs Chemical Lab., Harvard U., Cambridge, Mass.
THE EMISSION OF VACUUM ULTRAVIOLET RADIATION FROM THE ACETYLENE-OXYGEN AND THE METHANE-OXYGEN REACTIONS IN SHOCK WAVES,
by G. B. Kistiakowsky and L. Willard Richards.
12 Sep 61, 18p. illus. 12 refs.
(Contract Nonr-1866(36))
Unclassified report

DESCRIPTORS: (*Acetylenes, Chemical reactions with *Oxygen, *Reaction kinetics, *Ultraviolet radiation.) (*Methanes, Chemical reactions with Oxygen, Reaction kinetics, Ultraviolet radiation.) (Chemical reactions in Shock waves.) (Ultraviolet spectroscopy, Photoemission, High temperature research, Argon, Spectrographic analysis, Thermochemistry, Test equipment, Shock tubes, Photoemission.)

The C2H2-O2 and CH4-O2 reactions were studied by observing the emission of vacuum UV radiation from shock waves in gas mixtures containing 85 to 99% Ar. In both reactions after an induction period of length t sub i, the emission intensity rises exponentially with a time constant T and then decreases about as rapidly. For the C2H2-O2 reaction, emission predominantly in the wavelength range 1500 to 1700 Angstroms was observed. It was estimated that 1 photon was emitted in this range per 30,000 C2H2 molecules passing through the reaction zone at 1840 K. The integrated emission intensity depends on the temperature as if the process producing it had an activation energy of 15 kcal/mole. For the CH4-O2 reaction, the emission intensities were an order of magnitude smaller and more strongly temperature dependent than for the C2H2-O2 reaction. (Author)

AD-264 708 Div. 4, 25
(TIPSP/MFA) OTS price $2.60

Radiation Lab., Johns Hopkins U., Baltimore, Md.
ROTATIONAL STATES OF POLAR MOLECULES IN RARE GAS CRYSTALS: POINT DIPOLE APPROXIMATION,
by R. L. Armstrong. Oct 61, 25p. incl. table.
(Technical rept. no. WR-AF-2)
(Contract AF 33(616)6457)
Unclassified report

DESCRIPTORS: (*Molecular rotation in *Rare gases, *Crystals by Dipole moments by Numerical analysis.) (Cryogenics and Low temperature research of Molecules by Quantum mechanics.) (Crystal structure, Polarization, Excitation, Lattices, Electrostatics.) (Matrix algebra, Perturbation theory, Integral equations.)

A study is made of the rotational states of small concentrations of polar molecules trapped in a rare gas lattice at low temperatures. The polar molecules are assumed to be effective point dipoles so that exchange forces are neglected. The dispersion interactions of each polar molecule with the rare gas host are found to be spherically symmetric, to a good approximation. Dipolar coupling is found to produce an effective rotational potential function at the site of each polar molecule. This potential, which acts as a small perturbation, is found to create a second order splitting of the free molecular rotational levels. Some numerical values of these splittings are given for the molecules HCl and PH3. (Author)

AD-264 712 Div. 4, 25
(TIPSM/EJH) OTS price $1.60

Aberdeen U. (Gt. Brit.).
STRUCTURAL CHEMISTRY OF SILICATES AND RELATED SUBSTANCES,
by H. F. W. Taylor, L. S. Dent Glasser, and F. P. Glasser. 1 Sep 60, 18p. incl. illus. 13 refs. (Technical scientific note no. 1)
(Contract AF 61(052)276)
(AFOSR-172) Unclassified report

DESCRIPTORS: (*Calcium compounds, *Manganese compounds, *Silicates, Transformations, Phase transitions, Transition temperatures, *Wollastonite.) (Complex compounds, Calcium compounds and *Gallium compounds, Oxides, Phase studies.) (Complex compounds, *Calcium compounds, *Oxides, *Silicates, Hydrates or Carbon dioxide, Transformations, Phase transitions.) (*Single crystals, Crystals, *Crystal structure, *Lattices, Chemical bonds.) Electron diffraction analysis, X-ray diffraction analysis, Heat treatment.

Studies of oriented transformations, and crystal chemistry of oxides are described. Detailed study of the oriented transformations rhodonite to wollastonite provides direct evidence of the migration of Si during thermal transformations of silicates. The results of dry heating and hydrothermal treatment of a variety of other silicates are described. Crystal chemical studies, including a number of RO-R2O3 compounds are in progress. The stability relationships of the calcium gallates are described. (Author)

AD-264 717 Div. 4, 17, 25
(TIPSM/TCG) OTS price $3.60

Milan U. (Italy).
ELECTROCHEMICAL BEHAVIOUR OF OXYGEN AND HYDROGEN PEROXIDE ON MAGNETITE ELECTRODES,
by G. Bianchi, G. Caprioglio and others. Oct 60, 33p. incl. illus. tables, 20 refs. (Technical scientific note no. 3)
(Contract AF 61(052)260)
(AFOSR TN 60-1209) Unclassified report

DESCRIPTORS: (*Magnetite, *Electrodes, *Electrochemistry, Chemical reactions with *Oxygen, *Hydrogen compounds, Peroxides.) (Anodes (Electrolytic cell), Cathodes (Electrolytic cell), Polarization in Hydroxides, Solutions.) (Oxidation and reduction reactions of Oxides, Hydrides, Iron compounds, Solutions.) (Electron diffraction analysis, Measurement, Microstructure, Crystal structure, Electrodes, Surfaces.) (Reduction of Oxygen on Magnetite.) (Corrosion, Electrolysis.) *Electrolytic cells.

The electrochemical behaviour of O and H2O2 on magnetite electrodes was studied by means of both polarization curves and tension build-up and decay curves. In alkaline solutions, the O was reduced at a tension near to that corresponding to the process $O_2 + 2H_2O + 2e = H_2O_2 + 2OH(-)$; H2O2 in concentrated solutions (0.01M) was reduced at the same tension. The electrochemical process apparently involves the O arising from the H2O2 decomposition. Anodic and cathodic processes for H2O2 were symmetric. In neutral solutions, the processes concerning O and H2O2 occurred with the intervention of the redox systems of Fe(OH)3, Fe(OH)2 and Fe3O4. The surface modifications of the electrode produced during cathodic or anodic polarization were evidenced by means of electron diffraction. (Author)

AD-264 718 Div. 4, 17, 25
(TIPSM/TCG) OTS price $2.60

Milan U. (Italy).
ELECTROCHEMICAL BEHAVIOUR OF OXYGEN AND HYDROGEN PEROXIDE ON ALUMINUM, TANTALUM AND ZIRCONIUM ELECTRODES,
by G. Bianchi, G. Caprioglio and others. Dec 60, 15p. incl. tables, 22 refs. (Technical scientific note no. 4)
(Contract AF 61(052)260)
(AFOSR TN 60-1468) Unclassified report

DESCRIPTORS: (*Aluminum electrodes, *Tantalum, *Zirconium, *Electrodes, *Electrochemistry, Chemical reactions, Oxygen, Hydrogen compounds, Peroxides.) (Cathodes (Electrolytic cell), Polarization, Reduction, Acids, Hydroxides, Solutions.) (Voltage, Cathodes (Electrolytic cell), Reduction of Oxygen, Measurements.) *Electrolytic cell, Corrosion, Electrolysis.

The cathodic reduction of O and H2O2 on Al, Ta, and Zr was studied by means of a polarization cell and an electronic potentiostat. Al, Ta and Zr, although covered by an oxide layer, acted as cathode for the processes of O and H2O2 reduction. Overvoltage valves and the polarization curves are listed. The results obtained on these 3 metals are compared with those previously obtained on Ti. Overvoltages for cathodic reduction of O decrease in the following order: Zr, Ta, Ti for acid; Al, Ta, Zr, Ti for neutral; and Zr, Ti, Ta for alkaline solutions. These results indicate that the dangers of galvanic corrosion with Zr and Ta are less than those for Ti. (Author)

AD-264 772 Div. 4
(TIPSM/SEB) OTS price $2.60

Plastics Lab., Princeton U., N. J.
FURTHER STUDIES OF SOME SEMICONDUCTING POLYMERS,
by John A. Bornmann and Herbert A. Pohl.
10 Sep 61, 26p. incl. illus. tables (Technical rept. no. 63A)
(Contract DA 36-039-sc-78105)
Unclassified report

DESCRIPTORS: (*Semiconductors, *Polymers, Preparation, Synthesis, Molecular structure, Infrared spectroscopy, Conductivity, Determination, Measurement, Theory.) (Benzophenones, Anthracenes, Quinones, Phenanthrenes, Phthalic acids, Acetic acids, Benzoic acid, Anhyrides.)

The structure of certain semiconducting polymers was studied by means of conductivity and infrared measurements. The polymers are formed by the reaction of aromatic hydrocarbons with acids or acid anhydrides. The conductivities of various alternate polymers indicate that it can be concluded that the polymers prepared using phthalic anhydride, are not poly(aromatic) ketones, but possibly quinoid or lactone structures. A variety of new polymers showing electronic semiconduction were prepared using either phenanthrene or anthracene and various organic acidic compounds such as acids, acid anhydrides, acid chlorides, and imides. (Author)

AD-264 773 Div. 4
(TIPSM/SEB) OTS price $1.10

Pennsalt Chemicals Corp., Philadelphia, Pa.
PREPARATION AND SOME REACTIONS OF DIPHENYLPHOSPHINIC ISOCYANATE,
by Ivan C. Popoff and Barbara I. D'Iorio. Sep 61, 11p. incl. illus. (Technical rept. no. 27)
(Contract Nonr-268700, Proj. NR 356-408)
Unclassified report

DESCRIPTORS: (Phenyl radicals, *Phosphines, Isocyanic acids, Esters.) (Methyl radicals, Carbamates, Phosphines, Phenyl radicals.) (Amides, Phosphines, Phenyl radicals.) (Preparation, Synthesis, Chemical analysis, Chemical reactions.) Polymers, Phosphorus compounds.

Diphenylphosphinic isocyanate and its reaction products with methyl alcohol and water, methyl N-(diphenylphosphinyl) carbamate and diphenylphosphinic amide, respectively, were prepared and identified. Homopolymeric diphenylphosphinic isocyanates were isolated and one of them appears to be the trimeric compound 2,4,6-trioxo-1,3,5-tris (diphenylphosphinyl)-hexahydro-1,3,5,-triazine. (Author)

AD-264 778 Div. 4, 15
(TIPSP/MFA) OTS price $1.60

Mississippi U., University.
THERMAL RELAXATION IN FLUORINE,
by F. D. Shields. 13 Oct 61, 13p. incl. illus. tables.
(Contract Nonr-307801)
Unclassified report

DESCRIPTORS: (*Thermal stresses in *Fluorine and Halogens.) (Molecular structure, Energy, Vibration, Excitation.) (Measurement of Temperature, Sound, Absorption and Velocity in Gases.) (Equations, Computers, Data.) Tables. Relaxation time.)

Sound absorption and velocity measurements in fluorine at 228 C and 102 C indicate vibrational relaxation times of 20.7 and 10.7 microsec for these two temperatures respectively. The measurements were made inside a glass tube 1.73 cm in diameter using progressive waves. These results when combined with earlier results in the other halogens indicate certain changes which improve the accuracy of the Slawsky, Schwartz, and Herzfeld theory. (Author)

AD-264 827 Div. 4, 25
(TIPSM/SEB) OTS price $1.60

Washington U., Seattle.
(No title).
Technical rept. nos. 31-32.
1961, 20p.
(Contract Nonr-47716)
(ARPA Order no. 26-60, Task 2)
Unclassified report

DESCRIPTORS: (*Nuclear magnetic resonance, Fluorides.) (Atomic spectrum, Nuclear spins, Determination, Measurement, Theory, Analysis.) (*Sulfur compounds, *Fluorides.) (Sulfides, Fluorides, Oxyfluorides.) (Sulfides, Oxides, Fluorides.) (Methyl radicals, Fluorides, Oxyfluorides.) Fluorine, *Oxyfluorides.

This report includes:
HIGH RESOLUTION NUCLEAR MAGNETIC RESONANCE SPECTRA OF THE PENTAFLUOROSULFUR GROUP,
by C. I. Merrill, S. M. Williamson and others.
1961. (Technical rept. no. 31)
(Contract Nonr-47716)

High resolution NMR spectra were obtained for substances containing the -SF5 group. Complex spin-spin interaction effects were observed over a large range of J/delta values. A graphical

method is presented of estimating the values of delta, J/delta, and line positions in the spectra of AB4 NMR systems having J/delta values in the range of 0.15 to 0.7.

NUCLEAR MAGNETIC RESONANCE SPECTRA OF SOME HYPOFLUORITES,
by Claude I. Merrill and George H. Cady. 1961.
(Technical rept. no. 32)
(Contract Nonr-47716)

The NMR spectra of F2, OF2, SF5OF, SO3F2, and CF3OF were observed at room temperature with SF6 as an internal reference. F absorbs at lowest magnetic field strength while with increasing field absorption due to the hypofluorite F atoms fall in the order given above. Only the NMR spectrum of SF3OF exhibited observable second order spin-spin spectrum.

AD-264 852 Div. 4, 10, 27
(TIPSE/CCD) OTS price $1.10

Aerospace Corp., El Segundo, Calif.
LOW THRUST DEVICES VELOCITY CONTROL EXPERIMENTAL PROGRAM. CATALYTIC DECOMPOSITION OF HYDRAZINE.
Semiannual technical rept., 1 Jan-30 June 61.
by L. Schieler. 30 June 61, 6p. incl. table.
(Rept. no. TDR-594(1233-01)TR-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Hydrazines, Azides, *Catalysts, Catalysis, *Decomposition, Chemical bonds, Absorption.) (Liquid rocket propellants, Propellants.) (Thrust, Velocity, Control.) Gas generating systems.

For current applications requiring multiple engine operation normally a bipropellant start is used, wherein the catalyst bed is brought to the operating temperature by the heat released from the reaction of hydrazine with an oxidizer. In order to eliminate the added complexity of the propellant start, a catalyst capable of repetitive initiation of decomposition is required. The general nature of the required catalyst is largely determined by the rate controlling step and the mechanism of the actual decomposition reaction. Current immediate objectives are development of catalysts which are active toward catalytic decomposition of hydrazine; and the chemical modification of hydrazine to make it more susceptible toward catalytic decomposition. Catalytic activity will be evaluated by means of differential thermal analysis. Solutions of hydrazine are suggested as an additional technique for a more rapid conversion of hydrazine to decomposition products. It is recommended that hydrazine azide-hydrazine systems be included in any studies on the catalytic decomposition of hydrazine. (Author)

AD-264 868 Div. 4, 25, 17
(TIPSP/MFA) OTS price $2.60

Metals Research Lab., Carnegie Inst. of Tech., Pittsburgh, Pa.
RECONSIDERATIONS OF NUCLEATION THEORY,
by Jens Lothe and G. M. Pound. 1961, 23p.
(Contract Nonr-76008)
Unclassified report

DESCRIPTORS: (Theory of *Nucleation by *Quantum statistics on Crystal structure of Liquid metals, Mercury.) (Chemical reactions, Thermodynamics, Entropy, Crystals, Physical properties, Chemical properties, Ions, Molecules, Vapor.) Equations.

There are quantum statistical contributions to the free energy of formation of embryos and critical nuclei in transformations to condensed phases. They arise from consideration of the absolute entropy of the embryos or nuclei. In the case of homogeneous nucleation of water droplets from vapor the factor of increase in equilibrium concentration of critical nuclei is about 10 to the 17th power, resulting in a discrepancy of corresponding magnitude between the Becker-Doering equation and the critical supersaturation measurements. It is suggested that some of this disagreement may be removed by treating the problem as a transient rather than a steady-state situation and considering nonaccommodation in the smaller size classes. Also there is an appreciable quantum statistical effect in homogeneous nucleation of crystals from the supercooled liquid and a related effect in nucleation from the vapor of crystals on substrates. (Author)

AD-264 894 Div. 4
(TIPSM/SEB) OTS price $1.60

Massachusetts U., Amherst.
ORIENTATION STUDIES ON DRAWN POLYOLEFINS II,
by J. Powers, S. Hoshine, and R. S. Stein.
15 Aug 61, 18p. incl. illus. 12 refs. (Technical rept. no. 38)
(Contract Nonr-335700, Proj. NR 356-378)
Unclassified report

DESCRIPTORS: (Polymers, Films, *Butenes, *Pentenes, X-ray diffraction analysis, Mechanical properties, Crystal structure, Stresses, Molecular structure, Density, Tensile properties, Theory.) (Polymers, *Ethylenes.)

The x-ray diffraction, birefringence and stress-strain curves for polybutene-1 and polypentene-1 have been studied for quenched and annealed samples. The variation of crystalline orientation functions with elongation is calculated for polybutene-1. Differences among the variations of birefringence with degree of elongations of these polymers are compared with those for polyethylene and polypropylene and are discussed in terms of differences in molecular structure. Mechanical property variations are discussed in terms of differences in orientation properties. (Author)

AD-264 948 Div. 4, 25
(TIPSM/EJH) OTS price $2.60

North Carolina U., Chapel Hill.
CORRELATION OF TURBIDITY AND ACTIVITY DATA: II. TUNGSTOPHOSPHORIC AND TUNGSTOSILICIC ACIDS,
by M. Kerker, R. H. Ottewill and others.
15 Oct 61, 27p. incl. illus. tables, 33 refs.
(Technical rept. no. 7)
(Contract Nonr-85505; In cooperation with Clarkson Coll. of Tech., Potsdam, N.Y.)
Unclassified report

DESCRIPTORS: (*Tungsten compounds, *Silicic acids, *Phosphoric acids, *Solutions, Water, *Electrolytes, Light transmission, Light, Scattering, Vapor pressure, Measurement, Theory.) (*Acids, Refractive index, Density, Spectrographic analysis, Test equipment, Test methods.)

Turbidity and differential refractive index data are given for 12-tungstosilicic and 9-tungstophosphoric acids up to concentrations of about 1 g/ml at 546 mmu. Additional data at 436 mmu are given for 12-tungstosilicic acid. Isopiestic vapor pressure data from which the

activities of both solvent and solute are determined are given for 12-tungstosilicic acid. Also, densities of 12-tungstosilicic acid are reported. Activities and densities of 9-tungstophosphoric acid solutions obtained previously were used. Excellent agreement is obtained between activities determined from each of the two techniques, light scattering and isopiestic vapor pressure. Turbidities determined by these 2 techniques also agreed. (Author)

AD-265 051 Div. 4
(TIPSB/CCH) OTS price $2.60

Atlantic Research Corp., Alexandria, Va.
THE THERMAL DECOMPOSITION OF PERCHLORIC ACID VAPOR,
by Joseph B. Levy. 4 Oct 61, 24p. incl. illus. tables.
(Contract AF 49(638)813)
(AFOSR-1555) Unclassified report

DESCRIPTORS: (*Pyrolysis of *Perchloric acid, *Vapors in High temperature research with Kinetic theory, Measurement.) Instrumentation.

The thermal decomposition of perchloric acid vapor has been studied from 200 to 439 C. The reaction products over this temperature range have been found to be chlorine, water and oxygen. From 200 to 350 C the kinetics of the decomposition reaction have been studied by determining the rate of chlorine formation colorimetrically; from 350 to 439 C the kinetics were determined by a flow system technique. The results of the kinetic measurements are interpreted in terms of a heterogeneous reaction at the lower temperatures and a homogeneous one at the higher temperatures. A mechanism for the homogeneous reaction is proposed. (Author)

AD-265 055 Div. 4
(TIPSB/CW) OTS price $1.10

Applied Science Labs., Inc., State College, Pa.
RESEARCH STUDY OF PHYSICOCHEMICAL TECHNIQUES FOR THE PURIFICATION OF ORGANIC COMPOUNDS.
Bimonthly progress rept. no. 18, 1 July-1 Sep 61, by Robert Sweeny and Arthur Rose. 25 Oct 61, 7p. incl. tables.
(Contract DA 18-108-405-cml-176)
Unclassified report

DESCRIPTORS: (*Organic compounds, *Organic solvents, *Films, Membranes, Purification, Diffusion.) (Polymers, Solutions, Hexanes, Vinyl chlorides, Propenes, Phosphites, Silanes, Semipermeability.)

Permeation rate tests have been completed for the nine high molecular weight compounds with three films. Many instances of rates in the range 4 to 12 grams/hr-sq m were found. Permeation rates for neohexane through three films have been determined and rate factors calculated for n-hexane, ethanol, acetone, and chloroform. These limited results lead to reasonable conclusions regarding the relationship between chemical types and rate factors. The remainder of the rate studies on neohexane and high molecular weight compounds are nearing completion. (Author)

AD-265 178 Div. 4, 25
(TIPSM/EJH) OTS price $1.60

Pasteur Inst. (France).
PHOTO-ACTIVATED PRODUCTION OF FREE RADICALS FROM DIATOMIC MOLECULES AFTER ADSORPTION ON METALLIC SURFACES.
Annual progress rept., 1 Oct 60-30 Sep 61, by C. M. Moser. 30 Sep 61, 15p.
(Contract DA 91-591-EUC-1543)
Unclassified report

DESCRIPTORS: (*Carbon compounds, *Monoxides, *Nitrogen compounds, *Oxides, Atomic energy levels, Excitation, Hyperfine structure, Electron transitions, *Quantum mechanics, Atomic spectrum, Atomic structure.) (Crystals, *Nuclear magnetic resonance, Programming.) (Free radicals, Production, Photochemistry.)

A summary is presented of research on the calculation of ground and excited states of diatomic molecules (CO and NO) and the calculation of the magnetic and electric hyperfine constants of first row atoms. Discussions include: (1) electronic structure of CO; (2) nitric oxide; (3) magnetic hyperfine constant of the N atom; (4) dependence of induction and dispersion energies at finite internuclear distances; and (5) calculation of the magnetic resonance spectra of a system of 2 spins of 1/2 in polycrystalline material.

AD-265 205 Div. 4, 25
(TIPSM/SEB) OTS price $7.60

Clarendon Lab., U. of Oxford (Gt. Brit.).
PREPARATION OF SINGLE CRYSTALS OF YTTRIUM GALLIUM GARNET AND YTTRIUM ALUMINIUM GARNET, AND INVESTIGATION OF PARAMAGNETIC RESONANCE SPECTRA OF FOUR RARE EARTH IONS IN THESE GARNETS,
by M. Ball, G. Garton, and others. May 61, 72p. incl. illus. (Technical note no. 5)
(Contract AF 61(052)125)
(AFCRL-775) Unclassified report

DESCRIPTORS: (*Rare earths compounds, *Garnet, Crystals, Single crystals, Growth, Magnetic properties, Paramagnetic resonance, Nuclear spins, Crystal structure, Theory, Mathematical analysis.) (Silicates, Yttrium compounds, Gallium compounds.) (Silicates, Yttrium compounds, Aluminum compounds.) (Erbium, Dysprosium, Neodymium.) Ions.

An extensive survey is being conducted of the magnetic properties of rare earth ions in crystals with the garnet structure. Methods of preparing suitable samples are described, and results of low temperature microwave resonance experiments with Yb(3+), Dy(3+), Er(3+), and Nd(3+) ions are given. For each of these ions, the ground state is a doublet which can be characterized by three principal values of a g tensor, and with one exception, all the principal values have been determined for these ions in both yttrium aluminium and yttrium gallium garnet. The local environment of the rare-earth ions is far from being spherically or cubically symmetrical, so that the individual rare earth ions have magnetic properties which are very anisotropic. The relation of these results to the observed anisotropies in rare earth iron garnets and rare earth doped YIG are discussed. (Author)

AD-265 214 Div. 4
(TIPSM/EJH) OTS price $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE EPR STUDIES OF FREE RADICALS IN SOLUTION.
Technical rept. on Chemistry,
by W. C. Landgraf. Oct 61, 14p. incl. illus. tables (Rept. no. 6-90-61-66)
Unclassified report

DESCRIPTORS: (*Cumenes, *Hydrogen compounds, *Peroxides, *Photolysis, Ultraviolet radiation, Free radicals, Paramagnetic resonance, Spectrographic analysis.) (Organic solvents, Cumenes, Ethyl radicals, Benzenes, Toluenes, Hexanes, Deuterated compounds.) (Oxygen, Degasification.) Photochemistry, Chemical reactions, *Photochemical reactions, *Reaction kinetics, Decomposition, Low temperature research, Recombination reactions.

Work carried out in the following report was initiated to determine the nature of the process which involves photolytically engendered radicals in a solvent environment. Observations of these short-lived intermediates were conducted by electron-spin resonance at reduced temperature. The experiment demonstrates the facility with which the observations can be made. The terminating process, in particular, was studied, and rate constants and activation energies were determined. A unique oxygen interaction with the solvent was noted during the photolytic experiments. (Author)

AD-265 215 Div. 4
(TIPSM/BRW) OTS price $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
A STUDY OF THE ANODIC FILM FORMED ON TITANIUM.
Technical rept. on Materials and Chemistry,
by M. Tecotzky. Oct 61, 14p. incl. illus. tables, 10 refs. (Rept. no. 6-90-61-76)
Unclassified report

DESCRIPTORS: (*Titanium, Oxidation, Films, Anodes (Electrolytic cell), Ethyl radicals, Hydrogen compounds, Phosphates, Electrolytes.) (Films, Deposits, Chemical analysis, X-ray diffraction analysis, Electron diffraction analysis, X-ray spectroscopy, Spectrographic analysis.) Electrochemistry.

A physical and chemical study has been made of the anodic film formed on Ti. The films were prepared by anodizing Ti in an aqueous solution of ethyl hydrogen phosphate. X-ray diffraction, emission spectrography, and chemical investigation indicate that the film formed contains P and is the rutile modification of TiO2. It is possible that 2 films are formed, one of rutile, and one containing an amorphous Ti phosphate species. (Author)

AD-265 218 Div. 4
(TIPSM/SEB) OTS price $1.10

Olin Mathieson Chemical Corp., New Haven, Conn.
THE PREPARATION OF PHOSPHITE AND PHOSPHINITE DECABORANES,
by R. J. Polak and T. L. Heying. 2 Nov 61, 5p.
(Technical rept. no. 1)
(Contract Nonr-339500, Proj. NR 356-431)
Unclassified report

DESCRIPTORS: (*Decaboranes, *Phosphorus compounds, Phosphites, Preparation, Synthesis.) (Chemical reactions, Substitution reactions.)

Organic phosphite were reacted with B10H14 in refluxing benzene to produce the corresponding B10H12 derivatives. Higher yields were obtained when the replacement reaction with bis(acetonitrile) was employed. The best yields were obtained with bis(diethylsulfide)decaborane. (Author)

AD-265 220 Div. 4, 14
(TIPSB/CCH) OTS price $.50

Naval Research Lab., Washington, D. C.
THE EFFECT OF POLAR-NONPOLAR SOLUTES ON THE WATER WETTABILITY OF SOLID SURFACES SUBMERGED IN OIL,
by W. D. Bascom and C. R. Singleterry. 1 Sep 61, 15p. incl. illus. tables (NRL rept. 5663)
Unclassified report

DESCRIPTORS: (Effectiveness of *Chemicals on Water,) (*Wetting agents of Surfaces, Solids in Oils, Mathematical analysis.) (Displacement reactions on *Polymers.)

A study has been made of the effect of polar-nonpolar solutes on the contact angles exhibited by water drops on polytetrafluoroethylene, polyethylene, and stainless steel surfaces submerged in decane, isopropylbiphenyl, and bis(2-ethylhexyl) sebacate. The solutes investigated included the oil-soluble metal salts of dinonylnaphthalene sulfonate and a water-soluble amphipath, sodium dodecylsulfate. A parabolic relation was found between the cosine of the contact angle, and the oil/water interfacial tension, and this was shown to be consistent with the Young-Dupre equation which gives the relation between the angle and the three interfacial energies that act at the oil/water/solid line of intersection. The experimental data also provide a measure of the work required to displace water from the submerged surfaces. It was found that the work required to displace water from the surface of polytetrafluoroethylene was generally greater than the work necessary to displace water from the surface of polyethylene. This was a result of the polytetrafluoroethylene having a greater interfacial energy against the oils than does polyethylene. An analytic treatment of the data was developed which gave a numerical indication of the various oil/polymer interfacial energies. This treatment also suggested that the polar-nonpolar solutes were adsorbed at both the water/polymer and oil/water interfaces. (Author)

AD-265 232 Div. 4
(TIPSM/SEB) OTS price $6.60

University of Southern Calif., Los Angeles.
STUDIES OF RARE-EARTH HYDROGEN SYSTEMS.
Final rept., pt. 1,
by James C. Warf and Kenneth Hardcastle. Aug 61, 57p. incl. illus.
(Contract Nonr-22815, Proj. NR 052-390)
Unclassified report

DESCRIPTORS: (*Rare earth compounds, Hydrides, *Lathanum compounds, *Cerium compounds, *Ytterbium, Preparation, Synthesis, Thermodynamics, Heat of Dissociation, Pressure, Pyrolysis, Magnetic properties, Infrared spectroscopy.) (Crystals, Crystal structure, Molecular structure, Lattices, X-ray diffraction analysis, Nuclear magnetic resonance.) (Powders, Resistance.) Europium, Lutecium, Scandium, High pressure research, High temperature research, Theory, Mathematical analysis.

A gage permitting measurement of pressures up to 65 atm was built and the hydrides of La, Ce, and Yb were investigated. Equilibrium dissociation pressure-temperature-composition data were obtained for La- and Ce-H systems. Heats of dissociation were calculated of LaH2.70, LaH2.80, CeH2.80, and CeH2.90. The lattice constant for a specimen of CeH2.97 was 5.539 A. Absorption of H at about 20 atm and several hundred degrees by Yb samples yielded YbH2.56, YbH2.2, and YbH2.58. X-ray diffraction photographs of these hydrides showed the presence of a new face-centered cubic (f.c.c.) phase. Thermally decomposed and quenched samples of YbH2.55 having the compositions YbH2.42 and YbH2.04 also contained an additional f.c.c. phase. Annealing of YbH2.04 effected conversion of this metastable substance to orthorhombic Yb dihydride and to the f.c.c. Measurements were made of the magnetic susceptibility of Yb hydride. IR data for Yb hydrides were compared with CaH2. Isotherms of dissociation pressure vs composition Yb hydrides consisted of 2 parts.

AD-265 240 Div. 4, 20
(TIPSM/TCG) OTS price $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
QUANTITATIVE RADIOCHEMICAL ANALYSIS. SOLVENT EXTRACTION OF MOLYBDENUM-99,
by L. Wish. 12 Sep 61, 14p. incl. tables (Rept. no. NRDL-TR-527)
Unclassified report

DESCRIPTORS: (*Radioactive isotopes, *Fission products, Mixtures, Radiochemistry, *Quantitative analysis, Separation of *Molybdenum and Technetium by Solvent extraction with Organic solvents of Oximes and Ion exchange.) (Chemical impurities and Contamination by Zirconium, Niobium, Iodine.) (Separation by Solvent extraction or Vaporization on Chemical reactions with Fluorides.) Gamma counters, Isotopes.

A method was developed for the rapid quantitative separation of Mo-99 from fission product mixtures. It is based on the extraction of Mo into a solution of alpha-benzoin oxime CHC13. The main contaminants were Zr, Nb, and I; the first 2 were eliminated by complexing with fluoride and the third by volatilization or solvent extraction. About 5% of the Te-99 daughter was extracted with its parent, and it was necessary to wait 48 hrs for equilibrium to obtain an accurate gamma ray counting result. The analysis of fission product mixtures by this method and a standard radiochemical gravimetric procedure showed agreement within 1-2%. (Author)

AD-265 251 Div. 4, 17
(TIPSM/REB) OTS price $1.60

North Carolina State Coll., Raleigh.
TERNARY CARBIDES AND NITRIDES OF THE TRANSITION METALS WITH METALS OF THE B-SUBGROUPS OF THE PERIODIC SYSTEM.
Final rept., 15 Sep 58-15 Sep 61,
by H. H. Stadelmaier. 13 Oct 61, 11p. incl. tables, 20 refs.
(Contract DA 36-034-ORD-2766, Proj. 2215)
(AROD Rept. no. 2215:22) Unclassified report

DESCRIPTORS: (*Carbides, *Nitrides of *Transition elements with Metals, Alloys.) (Manganese alloys, Iron alloys, Carbon alloys, Zinc alloys, Tin alloys, Aluminum alloys, Nickel alloys, Palladium alloys, Platinum alloys, Lead alloys, Gallium alloys, Germanium alloys, Mercury alloys, Indium alloys, Cadmium alloys, Cobalt alloys, Magnesium alloys.)

Among the many metal phases that exhibit close packing of the atoms, a new class, that occurs with some abundance, has been studied. The structure is characterized by the inclusion, in ordered positions, of B-metal atoms in the close-packed lattice of the transition metals Mn, Fe, Co, or Ni and by occupancy of the large interstices inside the transition-metal octahedra with C or N. The ideal structure is the perovskite structure as found in Mn3AlC. Primary concern was on establishing the existence of such ternary compounds and in many cases their exact composition. A fair understanding of the bonding in these phases has been gained and is brought out in the various publications based on the investigations. The ternary carbides usually solidify incongruently, are hard and brittle and show metallic luster. Their hardness compares with that of hardened steel. Engineering properties of systems containing the carbide have not been investigated extensively. These carbides account for the C in the diffusion layer of Fe-C alloys after hot-dip coating with Al, Zn, or Sn. (Author)

AD-265 270 Div. 4, 14
(TIPSM/EJH) OTS price $1.10

Frick Chemical Lab., Princeton U., N. J.
RUBBER ELASTICITY IN A HIGHLY CROSSLINKED SYSTEM.
by A. V. Tobolsky, D. Katz, and others.
25 Sep 61, 6p. incl. table (Technical rept. no. RLT-37)
(Contract Nonr-185807, Proj. NR 356-377)
Unclassified report

DESCRIPTORS: (*Synthetic rubber, *Elastomers, *Polymers, Sheets, Ethyl radicals, *Acrylic resins and Ethylenes, Glycols, Methyl radicals, Polymerization, Copolymerization.) Elasticity, Tensile properties, Mechanical properties, Temperature, Theory.

A series of polymer sheets were prepared from monomeric mixtures of ethyl acrylate and tetraethylene glycol dimethacrylate (TEGDM). The composition range of these sample varied between mole fractions of zero to unity for both components. Shear modulus-temperature measurements were made on these samples. All of the compositions exhibited a glassy region, a transition region and a rubbery plateau modulus. The temperature at which the rubbery plateau modulus was attained and the magnitude of the rubbery plateau modulus both increased with increasing amounts of TEGDM. At low concentrations of TEGDM the crosslinks may perhaps be regarded as tetrafunctional i.e., 2 network chains are to be associated with each molecule of TEGDM. At high concentrations of TEGDM, however, one might more properly associate 3 network chains with each molecule of TEGDM. A simple formula is proposed to account for the variation of the functionality of the crosslink. (Author)

Division 4-CHEMISTRY

AD-265 311 Div. 4, 10
(TIPSM/SEB) OTS price $1.10

Texaco Experiment Inc., Richmond, Va.
COMBUSTION OF ELEMENTAL BORON.
Quarterly summary rept.,
by U. V. Henderson, Jr. and Harry P. Woods.
1 Aug 61, 9p. incl. illus. tables (Rept. no. TM-1274; EXP-223)
(Contract Nonr-188300)
Unclassified report

DESCRIPTORS: (*Boron, Combustion, Chemical reactions with Chlorine compounds, Fluorides under Pressure.) (*Solid rocket propellants, Oxidation, Rocket oxidizers.)

The rate of reaction of B with ClF3 has been investigated over the pressure range 1 to 0.1 atm. The initial indications are that the rate of B consumption per unit area is roughly proportional to the partial pressure of ClF3 at constant total pressure and that a constant mass flow of undiluted ClF3 the rate of reaction is approximately constant over the tenfold pressure range. These data are consistent with the expected diffusion-limited reaction. (Author)

AD-265 313 Div. 4
(TIPSB/CCH) OTS price $1.10

Tulane U., New Orleans, La.
REACTION OF COPPER(II) HALIDES AND 8-HYDROXY-QUINOLINE,
by James C. Fanning and Hans B. Jonassen.
1 Aug 61, 6p. incl. illus. table. (Technical rept. no. 1)
(Contract Nonr-47509, Proj. NR 052-424)
Unclassified report

DESCRIPTORS: (*Chemical reactions, Physical properties, Copper compounds, *Halides, *Quinolinol.)

AD-265 316 Div. 4
(TIPSB/CCH) OTS price $1.10

Uppsala U. (Sweden).
THE OCTAHEDRAL COORDINATION IN ADDUCT MOLECULES. BOND LENGTHS AND BOND ANGLES,
by Carl-Ivar Branden, Arne Hansson and others.
20 Apr 61, 8p. incl. illus. tables (Technical note no. 13)
(Contract AF 61(052)43)
(AFOSR-476) Unclassified report

DESCRIPTORS: (*Crystal structure, Determination by Bonding.) (*Complex compounds of Molecules.) Sweden.

AD-265 318 Div. 4, 25
(TIPSM/EJH) OTS price $1.60

Technical U. of Norway, Trondheim.
AN ELECTRON DIFFRACTION INVESTIGATION OF THE MOLECULAR STRUCTURE OF BUTATRIENE,
by Otto Bastiansen. 27 Mar 61, 14p. incl. illus. tables.
(Contract AF 61(052)72)
(AFOSR-152) Unclassified report

DESCRIPTORS: (*Butenes, *Molecular structure, Molecular spectroscopy, Chemical bonds, Electron diffraction analysis.) Mathematical analysis, Theory, Synthesis.

The electron diffraction sector method was used to determine the structure of the butatriene molecule in the vapour phase. The error limits of all the parameters are approximately + or - 0.005 angstroms. As in several other molecules with linear equilibrium conformation, a shrinkage effect is observed; i.e. the observed non bonded CC distances are a trifle shorter than that calculated from the sum of the individual bond distances. The effect is explained by out-of-linearity vibrations. (Author)

AD-265 321 Div. 4, 25
(TIPSM/SEB) OTS price $3.60

University of Southern Calif., Los Angeles.
STUDIES OF RARE-EARTH HYDROGEN SYSTEMS.
Final rept. pt. 2; supplement to AD-265 232,
by James C. Warf and Kenneth Hardcastle. Aug 61, 40p. incl. illus. tables, 55 refs.
(Contract Nonr-22815, Proj. NR 052-390)
Unclassified report

DESCRIPTORS: (*Rare earth compounds, Crystals, Hydrides of *Lanthanum compounds, *Cerium compounds, *Ytterbium, Resistance, Nuclear magnetic resonance, Crystal structure, Lattices, X-ray diffraction analysis.) (Ytterbium, Hydrides, Magnetic properties, Chemical properties, Infrared spectroscopy, Test methods, Test equipment.) (Lutecium, Hydrides, Crystal structure.) Tests.

AD-265 346 Div. 4, 7, 14
(TIPSE/NTM) OTS price $2.60

Speer Carbon Co., Niagara Falls, N. Y.
DEVELOPMENT OF ELECTRODE MATERIALS FOR FUEL CELLS.
Quarterly rept. no. 4, 1 Apr-30 June 61,
by W. E. Parker, F. Rusinko, Jr., and R. W. Marek. 30 June 61, 25p. incl. illus. tables.
(Rept. no. SCC-11)
(Contract DA 36-039-sc-85356)
Unclassified report

DESCRIPTORS: (*Fuel cells, *Electrodes.) (Electrodes, Materials, Graphite, Pitch, Silicon, Carbon, Tests.) (Materials, Moisture-proofing, Surface area, Measurement, Porosity, Physical properties, Processing, Gas diffusion, Preparation.) Electrolytes, Electrochemistry.

The investigation of the use of various raw materials for electrode preparation planned for this project was completed. Studies on the effect of process variables on physical properties has continued and will be completed shortly. Efforts on the improvement of wetproofing behavior of electrode materials were increased as a result of work reported here which shows paraffin treatment obscures electrode surface area and decreases electrode permeability. The construction of a test fuel cell identical to that used at USASRDL is in progress to facilitate electrochemical evaluation of electrodes. (Author)

AD-265 362 Div. 4
(TIPSM/EJH) OTS price $3.60

Wales U. (Gt. Brit.).
REACTIONS RELATED TO OXIDATION.
Final technical rept. no. 1,
by T. Berces, W. E. Falconer and others.
28 Sep 61, 1v. incl. tables.
(Contract DA 91-591-EUC-1558)
Unclassified report

DESCRIPTORS: (Mixtures, Solutions, *Methanes, *Butanes, Ethanes, *Propanes, *Pentanes, *Ethylenes, *Propenes, *Chemical reactions, Hydroxides, *Free radicals, Alkyl radicals, Peroxides.) (Hydrocarbons, *Hydrogen, Atoms, Chemical reactions, Free radicals.) (*Free radicals, Production, Photolysis, Ultraviolet radiation, *Hydrogen compounds, *Peroxides or Nitric acid, Acetones or Ethyl radicals, Propyl radicals, Butyl radicals, *Ketones.) *Oxidation, Thermochemistry, Reaction kinetics, Substitution reactions, Low temperature research, Oxygen, Tables.

An extensive study of the abstraction reactions of hydroxyl radicals is reported. The radicals were formed by the photolysis of either H2O2 or HNO3 in dilute aqueous solution. The relative rates at which they attacked the lower alkanes were found. The relative rates of consumption of alkanes by the attack of radicals generated by the photolysis of a variety of ketones in the presence of an excess of oxygen is discussed. It was established that the active radicals were not alkyl peroxy radicals directly formed from alkyl radicals and oxygen. Results on the attack on the radicals on alkenes are described. An attempt was made to study the reactions of H atoms generated in H-O mixtures at high temperatures. The oxidation and competitive oxidation in very lean mixtures was also investigated. (Author)

AD-265 383 Div. 4
(TIPSM/SEB) OTS price $1.60

Calvin Coll., Grand Rapids, Mich.
OXYGEN ADSORPTION BY THE SILVER ELECTRODE,
by Thedford P. Dirkse and Leonard A. Vander Lugt. 1 Oct 61, 15p. incl. illus. tables (Technical rept. no. 13)
(Contract Nonr-168201, Proj. NR 359-364)
Unclassified report

DESCRIPTORS: (*Silver electrodes, Adsorption of Oxygen in Potassium compounds, Hydroxides.) (Electrode, Electric potential, Determination, Electrochemistry.) (Silver compound, Oxides.) (Anodes (Electrolytic cells), Oxidation.)

A study was made of the coulombic efficiency of the silver electrode in KOH solutions. The coulomb input during anodization is grear than the coulomb output during cathodization plus the coulomb equivalent of the O evolved. This is interpreted as due to adsorption of O by the electrode during the process in which AgO is formed. Both constant current and constant voltage conditions were used. (Author)

AD-265 420 Div. 4
(TIPSM/TCG) OTS price $1.60

Naval Research Lab., Washington, D. C.
AN INSTRUMENT FOR ON STREAM STRIPPING AND ANALYSIS OF DISSOLVED GASES IN WATER,
by D. D. Williams and R. R. Miller. 12 Sep 61, 12p. incl. illus. table (NRL rept. no. 5 78)
Unclassified report

DESCRIPTORS: (Chromatographic analysis, Water for Determination, Degasification of *Oxygen, *Nitrogen, *Carbon dioxide.) (Ultrasonics, Test methods, Test equipment, Calibration.) (*Gases, *Analysis in Liquids, Solutions.)

A multiple spinning disk stripper which utilizes the discharge carrier gas from the gas chromatograph was developed. Water was completely purged of its gas content in a single pass through this unit at carrier gas/H2O flow ratios of 10/1 through 1/2 for rates up to 100 cc/min. Stripping on a continuous basis with periodic sampling and analysis by gas chromatography provided a means for the on-stream monitoring of the dissolved gas content of water in the range of 0.02 cc/liter through saturation. Chromatograms and calibrations for O, N, and CO2 are shown. Previously tried ultrasonic stripping methods were ineffective. (Author)

AD-265 442 Div. 4, 25
(TIPSM/SEB) OTS price $1.60

Noyes Chemical Lab., U. of Illinois, Urbana.
PROTON MAGNETIC RESONANCE STUDIES OF POLYCRYSTALLINE URANIUM OXIDE-HYDRATES. I. BETA-UO32H2O,
by A. L. Porte, H. S. Gutowsky, and J. E. Boggs. 5 Sep 61, 17p. incl. illus. table, 25 refs. (Technical rept. no. 43)
(Contract Nonr-183413, Proj. NR 051-215; In cooperation with Glasgow U. and Texas U.)
Unclassified report

DESCRIPTORS: (*Uranium compounds, Oxides, *Uranates, Hydrates, Crystals, Protons, Resonance absorption, Crystal structure, Theory, Mathematical analysis, X-ray spectrum.)

The broad-line proton magnetic resonance spectra of polycrystalline samples of the compound formulated empirically as beta-UO32H2O have been investigated in the temperature range 77-350 K. The second moment of the absorption spectrum at 77 K indicates that some of the protons in the crystal are not present in water of crystallization and an analysis of the line shape shows that the compound is the trihydrate of pyrouranic acid, U2O5(OH)2.3H2O. The chemical properties of the compound are accounted for on the basis of this formula. (Author)

AD-265 471 Div. 4
(TIPSM/SEB) OTS price $1.60

Noyes Chemical Lab., U. of Illinois, Urbana.
PROTON MAGNETIC RESONANCE STUDIES OF POLYCRYSTALLINE URANIUM OXIDE HYDRATES. II. BETA-UO3H2O,
by A. L. Porte, H. S. Gutowsky, and J. E. Boggs. 11 Sep 61, 11p. incl. illus. (Technical rept. no. 44)
(Contract Nonr-183413, Proj. NR 051-215; In cooperation with Glasgow U. and Texas U.)
Unclassified report

DESCRIPTORS: *Uranium compounds, Oxides, Uranates, Hydrates, Crystals, Nuclear magnetic resonance, Spectrographic analysis, Tests, Theory.

The broad-line proton magnetic resonance spectra of polycrystalline samples of the compound formulated empirically as beta UO3H2O have been examined in the temperature range 77-370 K. Analysis of the spectrum at 77 K shows that the compound is UO2(OH)2. The inter-relationships between the different phases in the uranium trioxide - water system which involve the beta-modifications of the uranium trioxide hydrates are discussed. (Author)

5. COMMUNICATIONS

AD-264 722 Div. 5, 8
(TIPSP/MFA) OTS price $3.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
CODED, DIVERSIFIED, RAYLEIGH-FADED BINARY SYMMETRIC THRESHOLD CHANNELS.
Master's thesis,
by Russell R. Pfeiffer. 4 Dec 60, 32p. incl. illus. tables, 21 refs. (Technical rept. no. 384)
(Contract DA 36-039-sc-78108)
Unclassified report

DESCRIPTORS: (Digital systems, Communications theory, *Coding, *Transmission, Statistical tests, Probability, Information theory.) (Communication equipment, Channel selectors, Radio receivers, Circuits, Antennas.) (Signal-to-noise ratio, Errors, Impedance.) (Equations, Integration.) Thesis, Pulse communication systems.

The expressions for the probabilities associated with a Rayleigh-faded channel with null-zone detecting and diversity used are derived. Quantitative results of machine computation are presented for different orders of diversity. The bounds of decoding error of a coding scheme designed for a null-zone channel are evaluated. Quantitative results are presented for various word lengths and transmission rates. The channel statistics are combined with the coding-error bounds, and an examination of the effective power gains and increases in reliability is carried out. A few hypothetical tropospheric scatter links are set up to investigate the practicality of the combination. A qualitative determination of the situation for which it appears feasible to combine null-zone detecting, diversity, and coding is given. (Author)

AD-264 758 Div. 5
(TIPSE/VB) OTS price $2.60

National Cash Register Co., Hawthorne, Calif.
RESEARCH ON MAGNETIC ROD STORAGE AND CONTROL UNITS FOR A SWITCHING CENTRAL OFFICE.
Quarterly progress rept. no. 1, 15 Apr-14 July 61,
by D. Rork and P. Ellinger. 14 July 61, 18p. incl. illus. (Technical pub. no. 3405)
(Contract DA 36-039-sc-87212)
Unclassified report

DESCRIPTORS: (*Telephone communication systems, *Multichannel telephone systems.) (Digital systems, Panel boards (Electricity), Multiplex transmission, Switching circuits, Electronic switches, Semiconductors, Control, Storage, Data transmission systems, Pulse modulation, Amplitude modulation.)

Research is concerned with the design of a high-speed, digital switching central system with a minimum use of semi-conductor devices and a maximum utilization of the magnetic Rod as a logical and storage element. Digital switching techniques combined with an efficient use of the magnetic Rod will result in a switchboard design with high reliability, coupled with minimal size, weight, and cost. The system facilities to be incorporated into the preliminary system design of the digital switching central are outlined, and a general description of the preliminary system design utilizing the magnetic Rod is presented. Each major unit of the system is covered with a brief description of its functions. (Author)

AD-264 761 Div. 5, 2, 8
(TIPSE/CCD) OTS price $7.60

Norwegian Defence Research Establishment.
A STUDY OF POLAR RADIO BLACKOUTS. EXPERIMENTAL STUDIES.
Final technical rept.,
by O. Holt, B. Landmark and F. Lied. Apr 61, 76p. incl. illus. tables (NDRE rept. no. 35, pts. 1-3)
(Contract AF 61(052)08)
(AFCRL-910, pts. 1-3) Unclassified report

DESCRIPTORS: *Radio interference, *Radio communication systems, *Solar disturbances, Arctic regions, Diurnal variations, Aurorae, Absorption, Solar spectrum, Extraterrestrial radio waves, Electromagnetic wave reflections, Statistical functions, Ionospheric propagation, Radio waves, Refractive index, Wave transmission, Tests, Norway.

Contents:
Temporal and geographical characteristics of polar radio blackouts
Observation of electron density in the D-region during polar radio blackout conditions
Some results concerning the electron production and recombination in the D-region during polar radio blackout conditions

AD-264 829 Div. 5, 15
(TIPSP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON THE NUMBER OF INFORMATION SYMBOLS IN BOSE-CHAUDHURI CODES,
by Henry B. Mann. Aug 61, 13p. incl. table (MRC Technical summary rept. no. 249)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Information theory and *Computer logic on Coding.) (Algebra, Combinatorial analysis, Polynomials, Digital systems.) Tables.

Use is made of information theory on the number of information symbols that can be coded by the binary groups of Bose-Chaudhuri. Examples and proofs are presented and a table of values is given.

AD-264 873 Div. 5
(TIPSE/DLW) OTS price $9.10

Information Science Center, Collins Radio Co., Newport Beach, Calif.
THE FEASIBILITY MODEL OF THE DIGITAL COMMUNICATIONS SET, AN/GSC-4 FIELD TEST PROGRAM.
Final rept.
20 Feb 61, 102p. incl. illus. tables (Rept. no. CER-W1164)
(Contract AF 30(602)1932)
(RADC TR 61-226) Unclassified report

DESCRIPTORS: (*Secret communication systems, Data transmission systems, *Telephone communication systems, Digital systems, *Radio communication systems, Atmosphere, Scattering, *Television communication systems, Multiplex transmission, Panel boards (Electricity), Errors, Signal-to-noise ratio, Reliability, Distortion, Feasibility studies, Tests.) (Digital systems, Phase modulation, Synchronizers, Communication systems.)

A field test program was carried out to determine the feasibility of the AN/GSC-4 digital communications set. The AN/GSC-4 feasibility model was designed as a high-speed digital data modem for conveying binary data over toll telephone facilities. Laboratory tests were conducted to determine error rate characteristic as a function of white and impulse noise, frequency translation, and modulation. Field tests were conducted to determine the performance of the system over commercial phone lines, SAGE tropospheric scatter link, White Alice tropospheric scatter network, electronic switchboard, and the 465-L remote communications complex breadboard. The laboratory tests pointed out that a S/N ratio db was necessary for a binary error rate of 1 x 0.0001 when operating at 5400 bits/sec; for 2400 bit/sec operation, an error rate of 1 x 10 to the 6th power could be realized with SNR of 16 db with synchronization modulation. Without sync modulation a 3 db improvement is obtained. (Author)

AD-264 907 Div. 5
(TIPSE/DLW) OTS price $1.60

Tracerlab, Inc., Waltham, Mass.
THE UTILIZATION OF X-RADIATION AS A COMMUNICATIONS MEDIUM IN OUTER SPACE,
by Joris Brinkerhoff and Paul Fredrickson.
23 June 61, 10p.
(Contract AF 30(602)2189, Proj. 4519)
(RADC TR 61-219) Unclassified report

DESCRIPTORS: (*X rays, *Communication systems, Feasibility studies.) (X rays, Space environmental conditions, Wave transmission, Modulation, Bremsstrahlung, Absorption, Detection, Effectiveness.)

An attempt is made to set forth certain conditions for the optimum utilization of x-radiation as a means of communication in outer space. The broad areas of consideration include: (1) the question of proper selection of x-ray energy in relation to the expected background radiation in outer space, (2) means of generation of the x-radiation, (3) means for its detection, and (4) the conditions for modulation and demodulation which would permit the most rapid and reliable transmission of information. (Author)

AD-264 910 Div. 5, 8
(TIPSP/WH) OTS price $4.60

Pisa U. (Italy).
RECOVERY OF INFORMATION TRANSFERRED INTO PHASE MODULATION IN IONOSPHERIC WAVE PATHS.
Annual summary rept. 1 Feb 60-31 Jan 61,
by Ugo Tiberio, Mario Mancianti, and Giovanni Salardi. Feb 61, 42p. incl. illus.
(Contract AF 61(052)359)
(AFCRL-738) Unclassified report

DESCRIPTORS: (*Radio waves, *Modulation, Amplitude modulation, Recovery of Radio signals, Radar signals.) (*Radio transmission, Ionospheric propagation, Ionosphere, *Phase modulation, Radio waves.) (*Detectors, Radio receivers, Radar receivers.)

The recovery of the information originally impressed onto the signal as amplitude modulation which was transferred in phase modulation travelling in the ionosphere is treated. In the first part, the principles are given on which the realized apparatus and that to be realized is based. In the second part the experimental basis of the phenomenon being investigated is discussed. Next the entity of these is theoretically investigated in order to ascertain whether the recovery is practically useful. A detailed description of the tried apparatus and of the results thereby obtained follows. (Author)

AD-265 115 Div. 5, 8
(TIPSP/MFA) OTS price $3.60

Cook Research Labs., Morton Grove, Ill.
INVESTIGATION OF PULSE INTERFERENCE CONTROL VIA SOLID STATE DEVICES.
Interim engineering rept. no. 2, 15 June-15 Sep 61,
by I. N. Mindel. 15 Sep 61, 31p. incl. illus. tables.
(Contract AF 33(616)8128)
Unclassified report

DESCRIPTORS: (*Pulse communications systems, Communication equipment, Electronic equipment, Electric shunts, Interference, *Radio interference, Control, *Solid state physics.) (Crystal structure, *Semiconductors, Diodes, Ferrites, Dielectrics, Electronics.) Instrumentation, Tables.

An investigation and development of techniques and equipments suppressing pulse type interference by means of solid state devices is presented. The following conclusions and recommendations can be drawn from the foregoing analysis: (1) The use of presently available semiconductor diodes as shunt limiting elements for the signal levels of interest is not feasible. (2) It is recommended that further investigation be conducted to determine the feasibility of utilizing diodes in other circuit configurations. (3) Investigation into the feasibility of developing diodes with lower contact potentials should be considered. (4) Due to the large number of people doing research into the area of ferrites, our efforts along these lines should be the passive role of observer rather than taking an active part in this research. (5) Low power, long life, active solid state techniques of suppressing pulse interference should be investigated. (Author)

AD-265 144 Div. 5, 8
(TIPSE/CRJ) OTS price $1.10

Electronic Communications, Inc., Timonium, Md.
AM-1976 (XN-1)/SRT.
Final engineering rept.
1960, 4p.
(Contract NObsr-72737)
Unclassified report

DESCRIPTORS: (*Radio transmitters, *Communication equipment, Shipborne, Electronic circuits, Design.) (Radiofrequency amplifiers, Capacitors, Low pass filters, Design.) (Standing wave ratios, Measurement.) (Amplifiers, Cooling, Electron tubes.)

Improvements are described which were made on previously designed equipment designated AN/SRT-20. This equipment was used as the basis for the AM-1976 (XN-1)/SRT transmitters and includes the plate blocking capacitor, low pass filter, amplifier tube cooling system, shorting switches, and amplifier tubes. Data are also presented on the bypass capacitance, input VSWR, interference, and increased power of this transmitter equipment.

AD-265 175 Div. 5, 12
(TIPSE/DLW) OTS price $3.60

ITT Kellogg, Chicago, Ill.
FIXED GROUND COMMUNICATION SYSTEMS WEAPONS SYSTEM 107A-1.
Program progress rept. no. 53 for Sep 61.
Sep 61, 36p.
(Contracts AF 04(647)123, AF 04(647)312, AF 04(647)461, AF 04(647)462, AF 04(647)486, AF 04(647)495, AF 04(647)502, AF 04(647)503, and AF 04(647)608)
Unclassified report

DESCRIPTORS: (Guided missiles, Surface to surface, Surface to air, *Launching sites, Ground support equipment, Communication systems, Communication equipment, Telephone communication systems, Telephone cables, Public address systems, Maintenance, Installation.)

AD-265 275 Div. 5, 15
(TIPSP/MFA) OTS price $8.10

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
ON THE OPTIMUM DESIGN OF PREDICTOR CONTROL SYSTEMS,
by Sheldon Horing. 24 Aug 61, 88p. incl. illus. 20 refs. (Rept. no. PIBMRI-945-61)
(Contract AF 18(603)105)
(AFOSR-1412) Unclassified report

DESCRIPTORS: (Design, *Mathematical prediction, Linear systems, Control systems, *Boundary layer control systems, Electrical networks, *Communications theory, Digital systems, Computers, Feedback, Programming, Linear programming.) (Functions, Combinatorial analysis, Statistical tests, Computer logic, Least squares method, Sequential analysis, Statistical distributions, Probability.)

The basic optimization problem of Predictor Control Systems is viewed, in very general terms, as a problem in decision theory. Based on available information, the decision must be made as to which of the allowable control signals should be applied to the plant in order to achieve the optimum performance. A sum of squared error criterion is used to define the optimum in order to reduce the problem to a problem in linear decision theory. A piecewise-linear Control Boundary is found which can be used to generate the desired control signal. The realization of this Control Boundary is shown to be straightforward and inexpensive. This technique can be applied to fixed linear plants of arbitrary order. A linear approximation to the optimum Control Boundary is discussed. The practical advantages of such an approximation are shown to be considerable. (Author)

AD-265 303 Div. 5
(TIPSE/DLW) OTS price $5.60

RCA Defense Electronic Products, New York.
RESEARCH ON PARAMETRON STORAGE AND CONTROL UNITS FOR A SWITCHING OFFICE.
Quarterly progress rept. no. 3, 1 Apr-30 June 61, on An Investigation Leading to the Design of a Parametron Switchboard,
by L. Stambler, A. Weiss, and J. Ceonzo.
31 July 61, 32p. illus. (Rept. no. CR-61-419-3C)
(Contract DA 36-039-sc-87170)
Unclassified report

DESCRIPTORS: (*Panel boards (Electricity), *Telephone communication systems, Military communications, *Trigger circuits, Switching circuits, Electronic switches, Electrical networks, Automatic, Control systems, Semiconductors, Electronic circuits, Storage, Design, Mathematical logic.)

The proposed system was implemented with detailed logic designs. Designs of the following circuits were completed: (1) line circuit, (2) register circuit, (3) common control circuit, (4) trunk circuit, and (5) operator's position. System timing studies were completed and timing charts were constructed. (Author)

AD-265 315 Div. 5
(TIPSE/RD) OTS price $19.75

Texas Instruments, Inc., Dallas.
ROCK STRATA PROPAGATION STUDIES.
Final rept.
20 Oct 61, 338p. incl. illus. tables.
(Contract AF 30(602)2113)
(RADC TR 61-222) Unclassified report

DESCRIPTORS: (Data transmission systems, Narrowband, Feasibility studies, *Military communications, Effectiveness.) (*Communication systems, *Seismic waves, Propagation, Signal-to-noise ratio, Sources.) (Waveguides, Underground structures.) (Signal-to-noise ratio, Mathematical analysis, Digital computers, Auditory signals.)

Seismic wave propagation use in the solid earth for information transfer is considered for military communications requirements. With seismic communications systems the entire system may possibly be underground. Hence, they may provide a hard back-up communications link, relatively invulnerable to general nuclear attack and difficult to jam. Texas Instruments performed theoretical studies, engineering analyses, and field experiments to further describe seismic wave propagation along interfaces. It was concluded that: (1) Narrow bandwidth communications to several hundred kilometers can be achieved within the present state-of-the-art. Transmission of a limited number of bits is possible using 10 to 1000-pound explosive charges. Transmission time is controlled by the velocity of the seismic waves (3 to 8 km/sec); (2) Seismic communication over longer ranges may be possible in some areas with more complex receivers and larger explosive charges, and (3) Seismic communications over continental ranges may be marginally feasible with the achievement of probably realizable major improvements. (Author)

AD-265 337 Div. 5
(TIPSB/MS) OTS price $6.60

Rand Corp., Santa Monica, Calif.
COST OF A HARDENED, NATIONWIDE BURIED CABLE NET-

WORK,
by J. Chester. Oct 60, rev. Oct 61, 62p. incl. illus. tables (Research memo. no. RM-2627-PR) (Contract AF 49(638)700), Proj. Rand)
Unclassified report

DESCRIPTORS: (*Cable assemblies, *Communication systems, Underground structures, Costs of Construction, Operation.)

A study was made of the cost magnitudes of building and operating a new, hardened buried cable communication network of nationwide coverage to be used by the military services, Central Intelligence Agency, State Department and the President in order to enhance the over-all capability of the network including its capability for survival in times of national emergency. Depending upon the hardness requirements imposed on such a network, (in terms of overpressure in pounds per square inch), initial investment magnitudes can be expected to run as high as $2.4 billion for a 100 psi configuration to $3.4 billion for the same network hardened at all points to 1,000 psi. It was assumed that these investment costs would be borne by private industry and the military users would pay for the service in the form of annual lease costs. The magnitude of the Air Force share of such annual charges in the current decade was estimated to vary from perhaps $550 million for a 100 psi network to as much as $780 million for the 1,000 psi configuration. It must be remembered, however, that the planned-for annual cost for the current type of soft, vulnerable communications for the Air Force in the same decade will represent a significant portion of those figures. The incremental annual increase in cost resulting from operation of a new network like the example used in this study would probably lie between $350 and $500 million for the 1,000 psi configuration. (Author)

AD-265 463 Div. 5, 30
(TIPSE/DLW) OTS price $10.10

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
A COMPUTER TECHNIQUE FOR THE CONSTRUCTION OF MUTUAL INTERFERENCE MATRICES.
Rept. on Electronic Equipment Interference Characteristics-Communication Type,
by T. T. Spengler, I. E. Perlin, and R. N. Bailey.
15 May 61, 124p. incl. illus. tables, 16 refs.
(Contract DA 36-039-sc-87183, Proj. 3x90-90-004)
Unclassified report

DESCRIPTORS: (Military communications, *Radio communication systems, Communication equipment, Radio equipment, *Radio interference, Mathematical prediction.) (Computers, Data processing systems, Computer logic, Programming, Test methods, Radio interference analyzers.)

Mutual interference matrices are of considerable utility in the process of interference reduction through frequency selection. Previously, the construction of these matrices was a formidable task. However, an automated procedure is described which makes the construction of mutual interference matrices a relatively easy job. The construction accuracy of the automated system is + or - 1/2 channel. However, the validity of a constructed matrix as a representation of the mutual interference effects between a receiver, and a transmitter is limited by the input design of the system. Running times for the construction system are quite reasonable. Relatively small scale matrices (e.g. 200 x 200) were constructed in about 2 minutes. (Author)

AD-265 475 Div. 5, 25
(TIPSE/CCD) OTS price $6.60

New Mexico U. Engineering Experiment Station, Albuquerque.
AIR-TO-UNDERSEA COMMUNICATION. ELECTROMAGNETIC FIELDS IN THE TWO MEDIA, CAUSED BY VERTICAL AND HORIZONTAL ELECTRIC DIPOLES IN AIR,
by S. H. Durrani. Sep 61, 60p. incl. illus. tables (Technical rept. no. EE-61)
(Contract Nonr-279801)
Unclassified report

DESCRIPTORS: (*Communication systems, Air to underwater, *Underwater communication systems, Electromagnetic fields, Electromagnetism, Wave transmission, Atmosphere.) (*Molecules, *Dipole moments, Electromagnetism.)

A brief description of the salient features of electromagnetic waves in a conducting medium is followed by a discussion of the practical ranges of various parameters involved in the problem of air-to-undersea communication at frequencies of 10 and 10 to the 5th power cps. Using the integrals given by Sommerfeld, expressions are developed for components of the pi vectors in both air and sea, in terms of certain auxiliary integrals and their functions, evaluated at specified points. It is found that the strongest E field in the sea is the horizontal component of the field produced by a vertical dipole in air. Combining this with the known results for E fields in air produced by submerged dipoles, it is concluded that from considerations of field strength alone, the best intercommunication scheme has a vertical dipole in air with a horizontal dipole in the sea. Some comments on reciprocity and a discussion of the practical communication-ranges are included. (Author)

AD-265 476 Div. 5, 25
(TIPSE/CCD) OTS price $1.60

New Mexico U., Engineering Experiment Station, Albuquerque.
AIR-TO-UNDERSEA COMMUNICATION WITH ELECTRIC DIPOLES,
by S. H. Durrani. 1961, 18p. incl. illus. tables.
(Contract Nonr-279801)
Unclassified report

Presented at the URSI-IRE Fall Meeting, Oct 23-25, 1961, in Austin, Texas.

DESCRIPTORS: (*Molecules, *Dipole moments, Electric dipole transitions, Electromagnetism.) (*Communication systems, Air to underwater, *Underwater communication systems, Electromagnetic fields, Electromagnetism, Wave transmission, Helicopters, Submarines.)

The ranges of various parameters involved in air-to-undersea communication at 10 to 10 to the 5th power cps are briefly discussed. Sommerfeld's integrals for the pi components in the two media are presented and are solved for the quasi-near range, subject to certain mild restrictions. This is accomplished by defining two auxiliary integrals, asymptotic series expansions for which are made available by extending the work of Banos and Wesley. The solution for pi leads to the derivation of electromagnetic field components. It is found that, from field strength considerations alone, the best inter-communication scheme consists of a vertical electrical dipole in air with a horizontal electric dipole in the sea. Simple calculations for estimating the satisfactory communication range are included. (Author)

AD-265 484 Div. 5, 6
(TIPSE/DLW) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
PROJECT ECHO - 960-MEGACYCLE, 10-KILOWATT TRANSMITTER,
by J. P. Schafer and R. H. Brandt. Oct 61, 23p. incl. illus. (Technical note D-1129) (In cooperation with Bell Telephone Labs., Whippany, N. J., Contract NASw-110)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1129.

DESCRIPTORS: (*Radio communication systems, Radio waves, Electromagnetic wave reflections, *Satellite vehicles, Radio equipment, Design.) (*Radio transmitters, Ultra high frequency, Frequency modulation, Phase modulation, Sidebands, Broadband, Radiofrequency power, Klystrons, Power amplifiers, Modulators, Test equipment, Design.) (Satellite vehicles, Radar tracking, Radar transmitters.) Amplifiers, Antennas.

A 10-kw transmitter operating at 960 to 961 mc was used at the eastern terminus of the Project Echo communications experiment. This transmitter is located on Crawford's Hill near Holmdel, New Jersey. The 10-kw output feeds into a waveguide line leading to a 60-foot dish antenna. Exciter-driver units are available to drive the power amplifier with various modulations, such as wide-deviation FM, low-index phase modulation, single-sideband or double-sideband modulation with or without carrier, 960.05 or 961.05 mc constant-frequency CW, and radar on-off pulses at 961.05 mc. The main output amplifier consists primarily of a four-stage, externally-tuned-cavity, water-cooled klystron, operating at a beam voltage of 16 to 18 kv. The transmitter was operated during many Moon-bounce, tropospheric scatter, and Echo I tests with very satisfactory results. (Author)

6. DETECTION

AD-264 933 Div. 6, 30, 8
(TIPSE/CRJ) OTS price $3.60

Hallicrafters Co., Chicago, Ill.
DIGITAL PULSE ANALYZER.
Progress rept. no. 2, 1 Jan-1 July 61,
by James Knapp. 28 July 61, 30p. incl. illus.
(Contract DA 36-039-sc-84974, Proj. 3E44-02-001)
Unclassified report

DESCRIPTORS: (*Pulse analyzers, Digital systems, Design, Delay lines, Printed circuits.) (*Radio receivers, *Radio interception, Radio signals, Analysis.)

The design of the digital pulse analyzer was completed. This included finalizing the design of the PRP analysis section. The design of the pulse amplitude memory and video amplifier circuits was completed. In addition, the rise time, fall time, and pulse width clipping and gating circuits were designed. The logic and driving circuits for the visual display and printer were also completed as was the power supply. A breadboard system test involving the major analysis sections was conducted. Chassis layout and fabrication for the analysis unit, the display unit and the power supply was started. The layout and artwork for printed circuit boards was also initiated. Several printed circuits boards were completed and tested. The final wiring and testing of the digital delay modules was started. The system test indicated that technical difficulties will be encountered during temperature and humidity testing. (Author)

AD-265 166 Div. 6, 25
(TIPSW/RD) OTS price $6.60

GB Electronics Corp., Garden City, N. Y.
RESEARCH AND DEVELOPMENT ON INFRARED DETECTOR.
Final rept.,
by Thomas E. Hill. Sep 61, 66p. incl. illus. tables (Rept. no. TR-89(F))
(Contract AF 33(616)6001)
Unclassified report

DESCRIPTORS: (*Infrared detectors, Design, Microwave frequency.) (Semiconductors, Photosensitivity, *Infrared photoconductors.) (Waveguides, Waveguide irises.) (Radio fields, Microwave frequency, Propagation, Mathematical analysis.) (Microwave networks, *Infrared optical systems, Cavity resonators, Semiconductors, Cooling.) (Semiconductors, Crystals, Electrical properties, Germanium.)

An IR detector which combines microwave concepts with infrared sensing elements was investigated. A photosensitive semiconductor is coincidently energized by a microwave electromagnetic field, and the infrared radiation to be sensed. Since the device employs no dc bias, associated IF noise is eliminated. Further, the sensing element is placed in a high microwave cavity which provides amplification of the order of Q/Pi without deterioration of the S/N. (Author)

AD-265 202 Div. 6
(TIPSB/MS) OTS price $3.60

Naval Radiological Defense Lab., San Francisco, Calif.
RESPONSE REQUIREMENTS FOR MILITARY RADIACS.
I. THE EFFECTS OF ARCTIC CONDITIONS ON THE PERFORMANCE OF NAVY RADIACS,
W. E. Knight, D. H. Williams, and H. R. Wasson.
29 Aug 61, 33p. incl. illus. (NRDL-TR-524)
Unclassified report

DESCRIPTORS: (*Gamma counters, Design, Arctic regions, Climatic factors, Effectiveness.)

A survey of the nature of arctic operating conditions was conducted to determine the factors important to radiacs. The results of the survey are summarized for application in radiac design. Under simulated arctic conditions involving low temperature and wind velocity, the two latest Navy gamma radiacs operate within the + or - 20% required accuracy for about 2 hr at -40 C. Simple thermal-insulating wraps extend the time about 1 hr. Alkaline manganese dry cells (type E95) substituted for BA-30 carbon-zinc cells render the radiacs virtually indifferent to temperatures as low as -40 C. Vibra-

tion at -40C C with type E95 had no deleterious effect. It was shown that operation of unmodified radiacs for a few hours is possible under arctic conditions if certain precautions are taken. If longer continuous operation is required, thermal insulation or change of battery type is necessary. (Author)

AD-265 336 Div. 6
(TIPSW/DLW) OTS price $19.75

Radio Corp. of America, Moorestown, N. J.
RADAR PARAMETER MEASUREMENT PROGRAM.
Interim rept. for 1 Apr-15 Nov 60.
15 Nov 61, 319p. incl. illus. tables.
(Contract DA 36-039-sc-78311)
Unclassified report

DESCRIPTORS: (*Radar tracking, Search radar, Radar equipment, C band, Instrumentation, Calibration, Effectiveness, Test facilities, Tests.) (Parametric amplifiers, Design.) (Electromagnetic waves, Radar reflections, Atmospheric refraction, Attenuation, Noise (Radar), Propagation, Radiometers, Errors, Measurement.)

The techniques and results are presented of the theoretical and experimental research leading to the improvement of the AN/FPS-16 radar system. Presented are the detailed findings and analyses of the experimental data taken during AN/FPS-16 (XN-3) tracking tests with carefully controlled conditions of test and radar operational parameters. The targets used for the tracking tests performed included boresight tower, balloon-carried single and dual spheres, and the sun to determine the effects of atmospheric refraction and attenuation, target multipath, target scintillation, angle tracking error due to thermal noise, and angular accuracy and precision of the sun and boresight target. Also presented are the findings and analyses of signal strength calibration and stability, field intensity measurements, range system automatic lock-on probability measurements, absolute accuracy of the radar pedestal system by star observation, and the initial development effort for breadboarded parametric amplifiers for the AN/FPS-16 radars. (Author)

AD-265 359 Div. 6
(TIPSE/RD) OTS price $4.60

Servo Corp. of America, Long Island, N. Y.
AN/TRD-15 AUTOMATIC READOUT.
Quarterly progress rept. no. 1, 1 May-31 July 61,
by C. Williams. 16 Oct 61, 40p. incl. illus.
(Rept. no. SCA-27900-RQ-1)
(Contract DA 36-039-sc-87279)
Unclassified report

DESCRIPTORS: (*Direction finding, Radio equipment, High frequency, Doppler systems, Instrumentation.) (Angle of arrival, Radio signals, Intensity, Determination, Display systems.) (Recording systems, Instrumentation.)

Research is concerned with an investigation to determine whether it is possible to provide an automatic feature to the direction finder which will eliminate the human operator or reduce the skill required of the operator. Progress is described toward instrumenting the AN/TRD-15 HF doppler direction finder for a study to determine the existence and degree of correlation between azimuth angle of arrival, vertical angle of arrival, signal strength, and harmonic content of the data signal, the purpose being to derive logic for an automatic readout system. An indicator which is capable of presenting both azimuth and vertical angles of arrival is described. (Author)

AD-265 398 Div. 6, 31, 30
(TIPSW/DLW) OTS price $4.60

Electric Boat Div., General Dynamics Corp.,
Groton, Conn.
DIGITAL SIMULATION OF A CONFORMAL DIMUS SONAR SYSTEM. PHASE I.
Rept. on Proj. SUBIC,
by Charles R. Arnold. 28 Feb 61, 37p. incl. illus. (Rept. no. U414-61-005)
(Contract Nonr-251200)
Unclassified report

DESCRIPTORS: (*Sonar, Sonar equipment, Digital systems, *Bearing finding, *Submarines, Display systems, Sound bearing finders, Hydrophones, Simulation, Submarine simulators, Digital computers, Tests, Signal-to-noise ratio, Measurement.)

The simulation is described of a conformal DIMUS sonar system on the IBM-704 digital computer. After a description of the computer programs, some results are given, first for the case of no-noise and later for different signal-to-noise ratios. Finally, the differences between linear and square law detectors on the bearing output taps are considered. Although the results of this digital simulation have not met the ultimate test of a comparison with an operational DIMUS system, they appear quite tenable and indicative of any DIMUS system. (Author)

AD-265 458 Div. 6, 8
(TIPSA/DLW) OTS price $7.60

National Aviation Facilities Experiment Center,
Atlantic City, N. J.
BEACON VIDEO DEFRUITING EQUIPMENT STORAGE TUBE TYPE 2.3NS9.
Final rept.,
by R. R. Barkalow and A. J. Penge. Mar 61, 79p. incl. illus. tables.
Unclassified report

DESCRIPTORS: (*Air traffic control systems, Identification systems, Radar equipment, *Radar interference, Video networks, Video signals, Reduction, *Storage tubes, Tests.) (Radar beacons, Signal-to-noise ratio, Display systems, Effectiveness.) Electron tubes.

Tests were made to determine the technical and operational merits of the storage tube defruiting equipment, 2.3NS9, designed for the filtering out of asynchronous replies of an air traffic control radar beacon system operating in an area of high electromagnetic radiation density emanating from normal beacon interrogators and radar environments. The equipment's ability to reject nonsynchronous reply signals in a ratio comparable to presently employed defruiting techniques was successfully demonstrated. The equipment's variable pulse repetition frequency makes it compatible with all radars presently employed in the air traffic control radar environment. (Author)

AD-265 498 Div. 6, 8
(TIPSE/DLW) OTS price $4.60

Radiation, Inc., Melbourne, Fla.
TELEMETRY TRANSDUCER HANDBOOK.
Monthly progress rept. no. 5, 15 Sep-15 Oct 61, by H. F. Fisher, Jr. 20 Oct 61, 46p. incl. illus. (Contract AF 33(616)8309, Proj. 4107, Continuation of Contract AF 33(616)7466)
Unclassified report

DESCRIPTORS: (*Telemeter systems, *Transducers, Research program administration, Instrumentation, Standards, *Handbooks.)

7. ELECTRICAL EQUIPMENT

AD-264 733 Div. 7
(TIPSB/MS) OTS price $1.60

Marine Corps Equipment Board, Quantico, Va.
BATTERY CHARGER FOR MODEL HR-18 BATTERY.
Final rept.
18 Sep 61, 20p. incl. illus. (Proj. no. 43-60-14)
Unclassified report

DESCRIPTORS: (*Battery chargers, Reliability, Acceptability, Tests.)

Tests were conducted on the silver-zinc, lead-acid battery charger to determine if the charger was suitable for charging the HR-18 battery. The charger will charge an HR-18 battery in 10 hours or less, requiring no adjustments or monitoring during the charge time. The battery charger has proven to be highly dependable in operation and will efficiently charge the HR-18, or lead-acid batteries. When modified, the charger will be suitable for Marine Corps use. (Author)

AD-264 807 Div. 7
(TIPSE/CRJ) OTS price $1.60

Sonotone Corp., Elmsford, N. Y.
DESIGN AND MANUFACTURE OF SEALED NICKEL-CADMIUM CELLS OF CYLINDRICAL DESIGN TO SIGNAL CORPS TECHNICAL REQUIREMENT SCL-7504.
Technical program letter rept. 1 Sep 60-29 May 61,
by Francis J. Alliegro. 29 May 61, 4p. illus. (Contract DA 36-039-sc-84496)
Unclassified report

DESCRIPTORS: (*Alkaline cells, *Storage batteries, Nickel, Cadmium, Design, Manufacturing methods, Tests.)

A design was established of the fourth series prototype which successfully passed the vibration requirements of SCL-7504. The design incorporates rectangular stack-ups for the core in all 3 sizes of cells. The core is immobilized by means of nylon wedges placed between the cylinder wall and the ends and edges of the stack-ups. The 10 A.H. cell design incorporates 2 sizes of plates, while the 50 A.H. and 100 A.H. each have 3 sizes of plates. Other final design features are as follows: (1) both terminals and vent on same end of cell, (2) flat end plates for cell container, (3) teflon seals, (4) non-woven polypropylene separator, (5) .023 in. positive and negative plates with 9 square inches of positive plate per A.H. of nominal capacity, (6) terminals insulated from cell container, (7) cell case material of stainless steel, and (8) 1.4 Sp. Gr. KOH electrolyte. Life cycling on early prototypes (10 A.H.) which contain paper separator and spiral core has reached 4000 c at the 20% depth of discharge. At this point the end of charge voltage was 1.46 and end of discharge voltage was 1.18. Life cycling of D size cells with polypropylene separator has reached 1700 c. (Author)

AD-264 870 Div. 7
(TIPSB/CCH) OTS price $1.10

Coast Guard, Washington, D. C.
TESTS OF SHORT-ARC LAMPS IN FLASH PANELS.
9 Oct 61, 4p. incl. illus. table (Rept. no. 261)
(Proj. no. CGTD J24-2/1-1-4(b))
Unclassified report

DESCRIPTORS: (Photometers, Tests of *Mercury lamps, Carbon arc lamps for Determination, Effectiveness, Carbon black on Intensity.) Measurement, Tables.

Photometric tests of several high-wattage short-arc lamps in two fourth-order (500 mm) flash panel lighthouse lenses are presented. Peak candlepower, horizontal divergence, and vertical divergence are given in 90-degree and 45-degree panels for the following lamps: GE HILS (formerly H400-E1) 400-watt mercury; Westinghouse SAH 250-A, 250-watt mercury short-arc; Westinghouse SAH 1000-A, 1000-watt mercury short-arc; Westinghouse SAH 2500-A, 2500-watt mercury short-arc; and Westinghouse SAHX 2500-A, 2500-watt mercury xenon-arc. In addition, the horizontal candlepower of the SAH 2500-A mercury short-arc lamp was measured periodically over a period of 288 hours to determine the effect of bulb blackening on lamp intensity. (Author)

AD-264 926 Div. 7
(TIPSE/CDM) OTS price $6.00

General Electric Co., Schenectady, N. Y.
THERMOPILE GENERATOR FEASIBILITY STUDY. PART III. PERFORMANCE STUDIES.
Final rept., 1 July 57-31 Mar 60,
ed. by D. L. Kerr. Aug 60, 402p. incl. illus. tables, 12 refs.
(Contract AF 33(616)5281, Proj. 3145)
(WADD TR 60-22, pt. 3) Unclassified report

DESCRIPTORS: (*Thermopiles, Generators, Feasibility studies, *Electric power production.) (*Thermoelectricity, *Generators, Design, Mathematical analysis.) (Airplanes, Satellite vehicles, Sandwich construction, Heat, Thermal insulation, Thermal radiation.) (Solar cells, Radioactive isotopes, Reactor cores, Reactor coolants.) (Shielding, Radiation hazards.)

A research and development study was made to determine means of employing thermopile generators as sources of electrical power in future air and space weapon systems. The following major areas of work were involved: (1) materials development, (2) junction fabrication and test, (3) thermoelectric generator applications stud-

ies, and (4) thermoelectric generator design. Work on thermoelectric generator applications studies as well as the more general aspects of thermoelectric generator design is reviewed. Research is also considered which can be grouped under the following major headings: (1) fundamental relations for predicting the performance of thermoelectric generators, (2) optimization studies, and (3) heat sources. A number of appendices are included, each of which covers the details of a particular investigation falling under one of the above headings. (Author)

AD-264 989 Div. 7, 14
(TIPSE/CRJ) OTS price $5.00

Electro-Optical Systems, Inc., Pasadena, Calif.
INVESTIGATION OF SOLAR CONCENTRATING PHOTOVOLTAIC POWER GENERATORS.
Interim summary rept.,
by Donald H. McClelland. May 61, 348p. incl. illus. tables (Rept. no. 530-IR-1)
(Contract AF 33(616)7346, Proj. 0(3-3145))
(WADD TR 60-849) Unclassified report

DESCRIPTORS: (*Solar cells, *Photoelectric cells, *Electric power production, Design.) (*Reflectors, *Mirrors, Electromagnetic properties, Errors, Mathematical analysis, Materials.) (Solar energy, Reflection.) (Reflectors, Mirrors, Materials, Plastic coatings, Metal films, Optics, Analysis.)

The results are presented of Phase I of a program to study and evaluate the use of concentration with photovoltaic power generators. The program is divided into 3 parts: (1) Preliminary investigation of all factors relating to the use of concentration with photovoltaic power generators; (2) Technical analysis of photovoltaic power generators in the power range from 500 to 1500 watts; and (3) Design, fabrication, and test of a 50-watt scale model of the 1500 watt power system. It was concluded from the work conducted to date that the use of concentration with photovoltaic power systems has important advantages at the present time and will become even more useful in the near future as better solar cell filters and fabrication techniques are developed. (Author)

AD-265 046 Div. 7, 8, 20
(TIPSE/CRJ) OTS price $10.10

Admiral Corp., Chicago, Ill.
EVALUATION-DEVELOPMENT OF MIL-C-14157B CAPACITORS FOR NUCLEAR RADIATION ENVIRONMENTS.
Final development rept.
21 Aug 61, 123p. incl. illus. tables.
(Contract NObsr-77612)
Unclassified report

DESCRIPTORS: (*Paper capacitors, *Radiation damage, *Radioactivity, Reliability, Measurement, Tests.) (Capacitors, Dielectrics, Plastics, Silicone resins.)

The performance is presented of the type CPM08 paper or paper/plastic dielectric capacitor in a combined nuclear-temperature-voltage environment. The principal causes of failure discovered as a result of the environmental test of the standard CPM08 capacitor were: gas evolution and a volume resistivity decrease of the dielectric fluid, embrittlement of the paper and hydrolytic degradation of the Mylar. E-200 capacitors performed exceptionally well in the environmental test with insignificant change in capacitance and dissipation factor. This was also the case for Samica dielectric film capactitors impregnant exhibited the best survival rate; however, changes in capacitance, dissipation factor and insulation resistance in the irradiated group were excessive. Isocyanate treated Mylar units failed very rapidly. It appears that the Mylar was not properly prepared to take advantage of the improved properties of the isocyanate treatment of Mylar. (Author)

AD-265 109 Div. 7
(TIPSB/LH) OTS price $1.60

Coast Guard, Washington, D. C.
ADDITIONAL CANDLEPOWER TESTS OF 300-MILLIMETER, CLOSED-TOP, DRUM LENSES,
by P. O. Chapman. 23 Oct 61, 3p. tables (Rept. no. 265)
(Proj. no. CGTD J24-2/1-1-22(a))
Unclassified report

DESCRIPTORS: (*Signal lights, Lighting systems, *Lenses, Light transmission, Luminescence, Tests.)

This report describes photometric tests of U. S. Coast Guard Type 1954, 300-millimeter, pressed-glass closed-top drum lenses. Lens-to-lamp ratios with a 6.2-volt 0.46 ampere marine signal lamp are given for five randomly selected lenses. For the same five lenses the mean horizontal beam candlepower is given with five of each of the following marine signal lamps: 12-volt, 0.77 ampere; 12-volt, 2.03 ampere; and 12-volt, 3.05 ampere. The effects of lens and lamp variations on performance are discussed. (Author)

AD-265 158 Div. 7
(TIPSE/DLW) OTS price $12.00

General Electric Co., West Lynn, Mass.
VOLTAGE REGULATION AND POWER STABILITY IN UNCONVENTIONAL ELECTRICAL GENERATOR SYSTEMS.
Quarterly progress rept. no. 4, 31 Mar-30 June 61.
30 June 61, 170p. incl. illus. tables.
(Contract NOw 60-0824-c)
Unclassified report

DESCRIPTORS: (Electric power production, *Generators, Power supplies, *Voltage regulators, Stability, Rectifiers, Transistors, Silicon, Design.) (Fuel cells, Thermionic emission, Thermoelectricity, Power supplies, Control systems.)

Test data on the internal impedance characteristics of a fuel cell are presented. The feasibility of using a control grid for the voltage control of a fuel cell is discussed and illustrated with test data. Steady state characteristics of a vapor thermionic converter are included. Applicable dc-dc and dc-ac circuits using silicon controlled rectifiers and power transistors are discussed. A qualitative evaluation of these circuits for use with unconventional power sources is included. The results of a survey of available silicon controlled rectifiers and power transistors are presented. A tentative study approach for evaluating the system (power source plus voltage converter) is given. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-265 185 Div. 7, 8
(TIPSE/WAW) OTS price $2.60

Kidde Aero-Space Div., Walter Kidde and Co., Inc., Clifton, N. J.
GENERAL USAGE FUNCTIONAL ASSEMBLIES.
Interim development rept. 1 Oct-31 Dec 60.
28 Feb 61, 20p. incl. illus. table.
(Contract NObsr-81323)
Unclassified report

DESCRIPTORS: (*Power supplies, *Electronic equipment, Design, Tests.) (Electron tubes, *Filaments, Heating.) (Semiconductors, Silicon.) Transistors, Voltage regulators, Oscillators, Detectors, Electric bridges, Diodes, Rectifiers, Radiofrequency filters.

Progress in the design and development of a family of regulated filament supplies utilizing semiconductor electronics throughout is reported. A breadboard representative of a new design technique for the family of filament supplies has been constructed and preliminary tests show the basic design to be capable of meeting the specified requirements. Initial measurements on preliminary breadboards representative of two different design techniques for the 6.3 volt, 20 amp class of regulated filament supplies show that the dissipative method exhibits a ±1/3% variation in true rms output voltage and the nondissipative technique exhibits an almost undetectable variation in true rms output voltage over the entire line-load continuum of 105 to 125 v line variation and 2.5 to 20 amp load variation. Design problems which remain are discussed. The work to date in the high voltage supplies consists of the breadboarding of a 1000 v dc regulated supply based on a class C oscillator. The low voltage level of 1000 v was chosen for prototype tests to alleviate the problems of arcing and insulation breakdown during initial circuit feasibility tests. (Author)

AD-265 199 Div. 7, 25
(TIPSP/WH) OTS price $6.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
A HYDROMAGNETIC D-C CONVERTER,
by Edward S. Pierson. Jan 61, 68p. incl. illus. tables, 53 refs.
(Contract AF 33(616)7624, Proj. 3145; Continuation of Contract AF 33(616)3984)
(ASD TR 61-102) Unclassified report

DESCRIPTORS: (*Motor generators, *Transformers, Direct current, Voltage.) (*Magnetohydrodynamics, *Liquid metals, Liquid metal pumps.) (Electric power production, Electrical engineering.)

The equations of hydromagnetics and channel flow are presented. The hydromagnetic dc converter is discussed, equations and an equivalent circuit are derived. The performance of the fluid generator with armature reaction is given, and the end effects are discussed. The theory is applied to the design of a converter, design equations are developed, and a design example for a converter with an efficiency greater than 50% is worked through. The effect of armature reaction on the design is demonstrated to show that compensation is necessary. The hydraulic design of the converter is discussed. The experimental model of the converter is described, and the theoretical and experimental performances are compared. The experimental results are presented in a series of graphs, and it is shown that the quantities vary as expected. (Author)

AD-265 213 Div. 7, 25, 20
(TIPSP/WH) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
PROTON DAMAGE TO SOLAR CELLS.
Technical rept.,
by K. T. Chow and E. A. Lodi. Aug 61, 31p. incl. illus. table (Rept. no. LMSD-703735-1)
(Contract AF 04(647)564)
Unclassified report

DESCRIPTORS: (*Solar cells, Silicon, Power supplies, Protons, *Radiation damage, *Space environmental conditions.) (Radiation damage, Radioactivation analysis, Proton beams, Instrumentation.) (Space environmental conditions, Simulation.)

The performance was evaluated of commercially available silicon solar cells which are to be used as a power source in the space radiation field surrounding the earth. The experiment was specifically designed to provide information on the proton radiation encountered by solar cells operating in space. The results indicated that a 25% reduction in maximum power output of the cell occurred at integrated fluxes of approximately 5 x 10 to the 9th and 10th power protons/sq cm for 3-Mev and 13-Mev protons, respectively. The cells were further irradiated to obtain a reduction in maximum power output of about 40 to 50%. Room-temperature annealing of the cells was observed for a period of four weeks with no significant changes occurring. The proton source, the apparatus for measuring the electrical output of the solar cell, and the results of the experiment are presented. (Author)

AD-265 222 Div. 7, 8
(TIPSE/WAW) OTS price $1.60

Kidde Aero-Space Div., Walter Kidde and Co., Inc., Clifton, N. J.
GENERAL USAGE FUNCTIONAL ASSEMBLIES.
Interim development rept., 1 Jan-31 Mar 61.
28 Apr 61, 14p. incl. illus.
(Contract NObsr-81323)
Unclassified report

DESCRIPTORS: (*Power supplies, *Filaments, Semiconductors, Rectifiers, Aging, Design, Tests, Electronic circuits.) Transistors, Oscillators, Voltage regulators, Diodes, Silicon, Relaxation oscillators.

Progress in the design and development of a family of regulated filament supplies utilizing semiconductor electronics throughout is reported. A model 20 ampere supply was constructed representative of electrical and mechanical techniques to be used for the family of filament supplies. Preliminary tests show that the model supply meets the specified electrical requirements. Initial measurements on the model 6.3 v, 20 amp filament supply based on the nondissipative technique show that the true rms output voltage exhibits an almost undetectable variation over the entire line-load continum of 103 to 127v line variation and no load to 20 amp load variation. The full load efficiency was greater than 90%. The major remaining problem is the suppression of radio frequency interference. The work to date in the high voltage supplies consists of the breadboarding of a 4kv dc regulated supply based on the Royer Transistor square wave inverter circuit. This circuit will provide an output voltage continuously variable between 2 and 4kv. With the use of voltage doublers and quadruplers the entire high voltage range of 4 to 16kv can be supplied. (Author)

AD-265 340 Div. 7, 8, 25
(TIPSE/DLW) OTS price $4.60

David Sarnoff Research Center, Princeton, N. J.
SEMICONDUCTOR PHOTOVOLTAIC CONVERSION.
Triannual rept. no. 2, 1 Mar-30 June 61,
by J. J. Wysocki, J. A. Scott-Monck, and others.
31 July 61, 42p. incl. illus. tables.
(Contract DA 36-039-sc-87417, Proj. 3A99-21-001)
Unclassified report

DESCRIPTORS: (*Semiconductors, Alloys, *Solar cells, Power supplies, Design.) (Thin films, Gallium compounds, Arsenides, Silicon, Intermetallic compounds, Phosphides, Conductivity, Resistance, Diffusion, Growth, Radiation effects, Measurement.)

The diffusion of P into GaAs using high P vapor concentrations led to surface concentnations up to 3 x 10 to the 22nd power/cc and clear indications of GaP and GaP-GaAs alloys. The diffusion profile contained regions of increasing, and then decreasing diffusion coefficient. A Boltzmann-type temperature dependence is not found. The radiation resistance of GaAs cells for 800 kev electrons is roughly equivalent to n on p Si cells with the same initial efficiency. An analysis based on the spectral response indicates the comparable performance may be due to the low minority-carrier lifetimes in GaAs. The radiation resistance of n on p Si cells made from floating-zone and quartz-crucible material appear to be the same. The lowest electron energy at which a change in bulk conductivity was observed is 167 kev in n-type and approximately 220 kev in p-type Si. (Author)

AD-265 382 Div. 7
(TIPSE/NTM) OTS price $1.60

Union Carbide Consumer Products Co., Parma, Ohio.
FEASIBILITY STUDY ON HIGH PERFORMANCE, SHORT DURATION POWER BATTERIES.
Quarterly technical progress rept. no. 13,
15 June-15 Sep 61,
by S. Senderoff, E. M. Klopp, and M. L. Kronenberg. 15 Sep 61, 15p. incl. illus. tables.
(Contract NOrd-18240)
Unclassified report

DESCRIPTORS: (Feasibility studies, *Primary batteries, *Power supplies.) (*Cathodes (Electrolytic cell), Materials, Sulfates, Sulfides, Ions, Oxides, Sulfur, Phosphates, Silicates, Borates, Carbonates, Solubility.) (Silver, Diffusion, Measurement.) (Electrolytes, Eutectics, Potassium compounds, Lithium compounds, Chlorides.) Radiochemistry, Blackbody radiation.

The first step in this investigation was the calculation of the theoretical output of a large number of thermodynamically feasible systems. The systems which were shown by these calculations to be theoretically capable of producing the required power density were investigated further. Since the cathodic portion of any thermal battery is generally agreed to be the limiting element, and since anodic reactions are better understood than cathodic reactions, the investigation was confined to the examination of potential cathodic materials. The power density specifications as set forth were used to determine the volume of the battery, and from this, assuming an over-all efficiency of 50 per cent, a simple cubic shape and black body radiation, the battery operating temperature was calculated as being approximately 1100 C. Since such a temperature would lead to a host of problems, not only with the battery components themselves, but also with the materials of construction, a lower operating temperature is necessary. (Author)

AD-265 424 Div. 7, 5, 6
(TIPSE/NTM) OTS price $1.60

Naval Research Lab., Washington, D. C.
ORANGE WAINSCOT LIGHTING SYSTEM FOR USE IN COMBAT INFORMATION CENTERS.
Final rept.,
by D. J. McLaughlin. 9 Oct 61, 11p. incl. illus.
(NRL rept. no. 5677)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: (*Combat information centers, *Lighting systems.) (Display systems, Visual acuity, Plan position indicators.) (Radar targets, Detection.)

A low-level lighting system has been developed for use in combat information centers, or wherever operators must conduct target detections from radar PPI's or other displays in darkened areas. The Orange Wainscot Lighting System (OWLS) allows occupants of the CIC to retain most of the dark adaptation of their eyes, yet permits greater freedom of movement and allows many maintenance tasks to be conducted without auxiliary lighting. The shade of orange light was recommended for reasons of operator comfort, and because it will allow recovery of dark adaptation almost as rapidly as the optimum red, and considerably faster than either white or blue. An installation of the OWLS has been made in conjunction with the Naval Data Handling System at the NRL Chesapeake Bay Annex. (Author)

AD-265 433 Div. 7, 8
(TIPSE/DLW) OTS price $1.10

Westinghouse Electric Corp., Baltimore, Md.
15 KW TRANSMISSION LINE MATCHING TRANSFORMER.
Interim development rept., 1 Apr-30 June 61.
30 June 61, 9p. incl. illus.
(Contract NObsr-72661)
Unclassified report

DESCRIPTORS: (*Radiofrequency transformers, Transmission lines, Impedance matching, Medium frequency, High frequency, Standing wave ratios, Signal generators, *Impedance bridges, Design.)

Investigations were made in the design of 2 transmission line matching transformers which operate over the frequency range 2 to 30 mc with a power rating of 15 KW, 100% modulated, and which are capable of transforming an unbalanced primary load (70 ohm resistive impedance with a VSWR no greater than 3 to 1) to a balanced secondary load (600 ohm impedance with a VSWR no greater than 3 to 1). Redesign of the transformer and detail drawings were completed. Fabrication of parts and assembly of units were also completed. Low power tests were continued. (Author)

Division 7 - ELECTRICAL EQUIPMENT

AD-265 440 Div. 7
(TIPSB/MS) OTS price $6.60

Science and Tech. Section, Air Information Div., Washington, D. C.
ELECTROMAGNETIC AND ELECTROSTATIC POWER GENERATORS. A REVIEW OF SOVIET LITERATURE.
1 Oct 61, 65p. incl. tables, 111 refs. (AID Rept. 61-139)

Unclassified report

DESCRIPTORS: (*Electrostatic generator, *Motor generators, *Generators, USSR, Bibliography.)

AD-265 461 Div. 7
(TIPSE/RD) OTS price $5.60

General Electric Co., Syracuse, N. Y.
OPTIMIZATION OF THERMOELECTRIC ENERGY CONVERTERS.
Bimonthly progress rept. no. 4, 15 Oct-14 Dec 60, ed. by Philipp H. Klein. 14 Dec 60, 53p. incl. illus. tables.
(Contract NObs-78403)

Unclassified report

DESCRIPTORS: *Thermoelectricity, *Generators, *Thermal conductivity, Encapsulation, Lead compounds, Tellurides, Materials, *Electric power production, Heat transfer, Thermal insulation, Chromium compounds, Antimonides, Magnesium compounds, Tantalum, Calcium compounds, Silicates, Intermetallic compounds, Bismuth alloys.

Consideration of thermal system No. 1 was continued. The source of heat for this system is saturated steam at 533 K (500 F), and the heat sink is sea water at 291 K (65 F). Results for forced-convection cooling have been compared with those for free-convection cooling. In addition, the possible improvements in performance that may result from use of better thermoelectric materials than are currently available have been computed. These results were obtained with the aid of a computer program designated NOBS-2. Progress was also made in the preparation of computer program NOBS-3, which provides a more accurate representation of the losses in electrical conductors, electrical contacts, and thermal shunts than is possible with the NOBS-2 program. In addition, general characteristics have been evolved for the next thermal system to be analyzed. (Author)

AD-265 462 Div. 7, 25
(TIPSE/DLW) OTS price $5.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
HIGH-TEMPERATURE BROAD-BAND SEMICONDUCTORS.
Quarterly technical summary rept., 1 Jan-31 Mar 61,
by S. W. Kurnick, M. F. Merriam and others.
10 Apr 61, 51p. incl. illus. tables (Rept. no. GACD-2165)
(Contract NObs-77144)
(ARPA Order no. 81-59) Unclassified report

DESCRIPTORS: (*Semiconductors, Broadband, *Thermoelectricity, Electric power production, Power supplies, Analysis.) (Rare earth compounds, Semiconductors, Metallic compounds, Oxides, Temperature, Electrical properties, Magnetic properties, Measurement, Theory.)

This report includes:
RARE EARTH SULFIDES AS HIGH-TEMPERATURE THERMOELECTRIC MATERIALS, by S. W. Kurnick, M. F. Merriam, and R. L. Fitzpatrick. 20 Jan 61, (Rept. no. GA-1929)

SOME REMARKS ON THE ULTIMATE PERFORMANCE OF RARE EARTH SULFIDES, by P. H. Miller, Jr. 1961.

ON THE APPLICATION OF THE SEEBECK EFFECT IN SOLIDS, by J. Appel. 10 Mar 61, (Rept. no. GAMD-2091)

Fundamental work on Ce-S was continued in the attempt to achieve better understanding of the electrical and thermal transport mechanisms of compounds having the Th_3P_4 structure. Work was begun on the synthesis and evaluation of related compounds which show promise as high-temperature thermoelectric materials. These are the Th_3P_4-structure rare-earth sulfides of La, Pr and Gd. Theoretical interpretation included analysis of the Seebeck coefficient in polar semiconductors. Emphasis was placed on polaron theory, a transport mechanism which shows promise in application for the selection of better thermoelectric materials. (Author)

8. ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-264 719 Div. 8
(TIPSE/RD) OTS price $6.60

Research Inst., U. of Michigan, Ann Arbor.
AN ANALYSIS OF THE BRETT ULTRA-WIDEBAND VIDEO AMPLIFIER.
by D. K. Adams. July 61, 55p. incl. illus.
(Technical rept. no. 122; Rept. no. 2899-55-T)
(Contract DA 36-039-sc-78283, Proj. 3A99-06-001-01)
Unclassified report

DESCRIPTORS: (*Video amplifiers, Broadband, Phase modulation, Analysis.) (Electronic circuits, Parametric amplifiers, Mathematical analysis, Electrostatic capacitance.)

A detailed analysis is made of the process of phase modulation by a nonlinear reactance element. This analysis is applied to a video amplifier circuit which shows this circuit to be capable of ultra-wideband amplification. The basic mechanism for this amplification is discussed in terms of several analytical viewpoints, which are ultimately shown to be consistent. Formulas for all basic circuit quantities are derived, including gain, bandwidth, input and output impedance, and noise figure. This analysis is used to predict optimum design techniques when nonideal components are incorporated in the circuit. An illustrative design is given for a video amplifier with 20 db gain, 100 Mc bandwidth (0 to 100 Mc), and a noise figure of less than 0.1 db. (Author)

AD-264 721 Div. 8
(TIPSE/DLW) OTS price $2.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
THE REFLECTION OF RADIO WAVES FROM AN IRREGULAR IONOSPHERE,
by M. L. V. Pitteway. 8 Nov 60, 26p. incl. illus. 15 refs. (Technical rept. no. 382)
(Contract DA 36-039-sc-78108)
Unclassified report

DESCRIPTORS: (*Radio waves, Electromagnetic waves, *Electromagnetic wave reflections, Scattering, Reflection, Diffraction, Atmospheric refraction, Refractive index, *Ionosphere, Fourier analysis, Partial differential equations, Theory, Matrix algebra.) (Ionosphere models, Wave transmission, Polarization, *Ionospheric propagation, Mathematical analysis.)

Investigations were made of the reflection of radio waves from an irregular ionosphere. Research was extended to take account of strong scattering. Solutions of the wave equation for a horizontally stratified ionosphere are used as a starting point, and the equations governing scattering for a simple two-dimensional model are written in a coupled form. A ray theory of scattering is examined from a wave theory viewpoint, applied to scattering by an irregular layer of free electrons. Limited results of numerical work are exhibited in curves. Physical interpretations are presented of the mathematics outlined and useful approximations are given to help future work. (Author)

AD-264 750 Div. 8
(TIPSE/RD) OTS price $9.10

Norwegian Defence Research Establishment.
A STUDY OF POLAR RADIO BLACKOUTS. EXPERIMENTAL EQUIPMENT.
Final technical rept.,
by B. Bjelland and O. Lytomt. Apr 61, 108p. incl. illus. (NDRE Rept. no. 35, pts. 4-6)
(Contract AF 61(052)08)
(AFCRL-910, pts. 4-6) Unclassified report

DESCRIPTORS: (*Radio transmission, *Arctic regions, *Ionospheric propagation.) (*Radio waves, *Absorption, Ionosphere, Measurement, *Extraterrestrial radio waves, Ionospheric disturbances.) (Test equipment, Electronic equipment, Electronic circuits.) (*Radio interference, Measurement, Test equipment.) Norway.

This report includes:
AN EQUIPMENT FOR MEASUREMENT OF THE GALACTIC NOISE LEVEL FOR A STUDY OF IONOSPHERIC ABSORPTION (Part IV).

AN EQUIPMENT FOR MEASUREMENT OF PULSED IONOSPHERIC CROSS-MODULATION (Part V).

AN EQUIPMENT FOR MEASUREMENT OF PARTIAL REFLECTIONS FROM THE LOWER IONOSPHERE (Part VI).

An equipment for measurement of ionospheric absorption by means of the A2 method is described. Some typical recordings of the measured galactic noise level are shown. (Author)

AD-264 765 Div. 8, 5, 30
(TIPSE/CCD) OTS price $10.10

Electronics Research Lab., Northeastern U., Boston, Mass.
(No title).
Final rept.,
by Sze-Hou Chang, J. Spencer Rochefort and others. 31 May 61, 126p. incl. illus. tables, 23 refs.
(Contract AF 19(604)3053)
(AFCRL-364) Unclassified report

DESCRIPTORS: *Communications theory, *Digital systems, Digital computers, *Information theory, Detectors, Coding, Multipath transmission, Mathematical analysis, Statistical analysis.

After first listing and summarizing previous publications issued under this contract, this Final Report contains the following studies: (1) The basic factors in multipath, and some existing systems of reducing these defects, are examined together with conjectures on possible modifications of these systems to improve bandwidth-time utilization. (2) Results of capability calculations of two special classes of 2-3 channels, the complete erasure channel, and the fractional erasure channel, are presented. A slope method for 3-3 and 2-3 channels is also discussed. A mathematical analysis of the ambiguity function for three classes of waveforms, and a theorem on the unimodular linear transformation of the ambiguity plane, are presented. (4) Two novel schemes of detection, an a posteriori probability computer for a digital communication channel with memory, and an asynchronous demodulator for double-sideband (carrier suppressed) transmissions, are studied. (5) A theoretical comparison is made on the relative per-word reliabilities in a digital channel between the uncoded case and the case where an error-correcting code is used at the same energy and time-bandwidth per word. (Author)

Division 8 - ELECTRONICS AND ELECTRONIC EQUIPMENT

AD-264 782 Div. 8, 30
(TIPSE/DLW) OTS price $6.60

Electronics Research Lab., Illinois Inst. of Tech., Chicago.
STUDY OF I.F. TRANSFORMERS FOR SINGLE SIDEBAND OPERATIONS.
Quarterly progress rept. no. 6, 1 May-31 July 61,
by George I. Cohn and Erwin W. Weber. 31 July 61, 63p. incl. illus. tables.
(Contract DA 36-039-sc-78342, Proj. 3-26-00-700)
Unclassified report

DESCRIPTORS: (*Intermediate frequency transformers, *Band pass filters, Piezoelectric materials, Quartz resonators, Sidebands, Electronic circuits, Synthesis, Design.) (*Digital computers, *Programming, Functions, Polynomials, Matrix algebra, Coding, Numerical methods and procedures.)

A SCRAP (Signal Corp Research Assembly Program) program is described for determining the designs which will approximate to a desired degree of accuracy for piezoelectric ladder bandpass filters with specified characteristics. The program is written for a Burroughs 220 computer equipped for SCRAPS (SCRAP System) operation. The program produces approximations for filters with up to fifteen piezoelectric resonators, including loss. (Author)

AD-264 787 Div. 8, 26
(TIPSE/DLW) OTS price $13.50

RCA Defense Electronic Products, Camden, N. J.
MICRO-MODULE PRODUCTION PROGRAM.
Quarterly rept. no. 13, 1 Apr-1 July 61.
1 July 61, 195p. incl. illus. tables.
(Contract DA 36-039-sc-75968)
Unclassified report

DESCRIPTORS: (*Subminiature electronic equipment, *Electronic circuits, Communication equipment, Computers, Electronic equipment, *Manufacturing methods, Production, Packaging, Design, Tests.) (Packaged circuits, Electrolytic capacitors, Ceramic capacitors, Resistors, Coils, Semiconductors, Crystals, Transistors, Diodes, Quartz crystals, Crystal holders, Materials, Thin films, Design.)

The remainder of the 640 micro-modules required for construction of subassemblies and for evaluation tests were made available. Prototype and final-grade trimmer capacitors rated at 1.5-to-5 micromicrofarads and 3-to-10 micromicrofarads were constructed successfully. The first 1000 hours of a 2000-hour life test at 85 C were completed with no reported failures. Assembly of prototype modules for the AN/TYK-9 ( ) (MicroPac) computer was initiated. Newly developed ceramic trimmer capacitors were introduced in the AN/PRC-51 radio set. Micro-element transistors in the new miniature package are used in all micro-modules. (Author)

AD-264 814 Div. 8, 26
(TIPSE/CRJ) OTS price $2.60

Transitron Electronic Corp., Wakefield, Mass.
INDUSTRIAL PREPAREDNESS MEASURE ON SILICON HIGH FREQUENCY POWER TRANSISTOR.
Quarterly rept., 1 Apr-31 June 61,
by David O'Brien. 31 June 61, 20p. incl. illus. tables.
(Contract DA 36-039-sc-81286)
Unclassified report

DESCRIPTORS: (*Transistors, Silicon, High frequency, Production, *Manufacturing methods.) (Silicon, Crystals, Processing, Cleaning, Diffusion.)

Work done on both the base and emitter diffusions resulted in an over-all yield from diffusions of 45%. This yield is judged from transistors which meet the leakage specifications at 60 volts and at 150 volts. These transistors are measured while they are on the silicon slice and have no contacts on them. The yield from transistors which go through the normal fabrication process is considerably lower due to subsequent operations. (Author)

AD-264 823 Div. 8, 25
(TIPSP/MFA) OTS price $4.60

Institute of Aerophysics, U. of Toronto, Canada.
APPLICATION OF AN ELECTRON GUN FOR THE MEASUREMENT OF DENSITY AND TEMPERATURE IN RAREFIED GAS FLOWS,
by E. O. Gadamer, E. P. Muntz, and G. N. Patterson. Apr 61, 21p. illus. tables (UTIA rept. no. 73)
(Contract AF 49(638)281)
(AFOSR 629) Unclassified report

DESCRIPTORS: (*Electron guns for Measurement of Density and Temperature in Gas flow.) (Supersonic flow, Nitrogen, X rays, Kinetic theory.) (Energy, Particles, Molecules, Electrons, Calibration, Excitation, Vibration, Volume, Pressure.) (Instrumentation, Wiring diagrams.) (Electronic equipment, Electron multipliers, Photomultiplier, Cathodes, Electron tubes, Electron beams.) (Plasma physics, Shock tubes, Mach number.) (Processing, Dissociation, Ionization, Fluorescence.) Chemical reactions, Tables.

Separate aspects are presented of a project aimed at the design and development of the electron gun as a diagnostic probe for the point-by-point investigation of low density flows without disturbing the motion. Part I was undertaken to provide a calculated flux distribution which could be measured by means of the density probe described in Part II. The further development of the electron gun for the determination of temperature at a point in a rarefied gas flow (Part III) was a subsequent project which greatly extended the usefulness of the electron gun in the low density laboratory. (Author)

AD-264 828 Div. 8, 7
(TIPSE/RD) OTS price $7.60

Westinghouse Electric Corp., Baltimore, Md.
PHOTOEMISSION SOLAR ENERGY CONVERTER.
Semiannual rept. no. 2, 1 Jan-30 June 60.
15 July 60, 1v. incl. illus. (Rept. no. 3845-2)
(Contract DA 36-039-sc-85248, Proj. 3A99-09-001)
(ARPA Order no. 80-59) Unclassified report

DESCRIPTORS: (*Solar cells, Photoelectric cells, Solar energy, Photoemission, Generators,

Design.) (*Phototubes, Electrodes, Tests, Processing.) Electron optics, *Electric power production, Space flight.

The use of photoemission as a method of converting solar photon flux into electrical power and the development of a high power-per-unit-weight unit suitable for space use are considered in this study. Experimental results using the WX-3964 photogenerator are presented, showing that one tube, having a relatively wide spacing of 70 mils, supplied output power of over 125 microwatts at an efficiency of 0.01 percent. A description of an experiment in the bell-jar processing station is presented and the operation of the automatic readout experiment is described. Steps leading to the manufacture and processing of the anode and photocathode are described, as well as the construction of the WX-4209, a thin glass-sandwich photogenerator. Changes in processes and procedures are noted, and work leading to an equivalent circuit for the photogenerator is given. (Author)

AD-264 896 Div. 8
(TIPSE/NTM) OTS price $6.60

Research Inst., U. of Michigan, Ann Arbor.
STUDY AND INVESTIGATION OF A UHF-VHF ANTENNA.
Quarterly progress rept. no. 5, 1 Apr-1 July 61,
by A. T. Adams, R. M. Kalafus and others.
Sep 61, 64p. incl. illus. tables, 162 refs.
(Rept. no. 3667-5-P)
(Contract AF 33(616)7180)
Unclassified report

DESCRIPTORS: (*Antennas, Airplane antennas, Airborne, Ultra high frequency, Very high frequency, *Loop antennas, Broadband, Ferrites, Dielectrics.) (Electromagnetic waves, Diffraction, Microwaves, Mathematical analysis, Scattering.) (Spheres, Waveguides, Cylindrical bodies, Materials.)

The theoretical study of plane-wave diffraction by a ferrite sphere has been extended to (1) evaluate the effect of higher modes, (2) map the lines of power flow, and (3) treat the case of an enclosed, perfectly conducting sphere. The theoretical study of plane-wave diffraction by a ferrite cylinder has been extended to treat the longitudinally magnetized case. An analysis of the resonance condition for the shielded, balanced-loop antenna immersed in a ferrite medium has been made. Conditions for maintenance of resonance over a broad frequency range have been obtained and found to be fairly consistent with the published properties of known ferrite materials. The analysis suggests the possibility of tailoring ferrite properties for broadband use in microwave components and antennas. Experimental results of the measurement of ferrite materials are given. (Author)

AD-264 900 Div. 8, 2, 12
(TIPSP/GW) OTS price $1.60

Astrophysical Observatory, Smithsonian Institution, Cambridge, Mass.
EFFECTS OF THE EARTH'S IONOSPHERE ON HF RADIO ASTRONOMY FROM ARTIFICIAL SATELLITES.
Rept. on Research in Space Science,
by M. D. Grossi, K. M. Strom, and S. E. Strom.
2 Oct 61, 16p. incl. illus. (Special rept. no. 76)
Unclassified report

DESCRIPTORS: (Ionosphere, *Radio astronomy, *Satellite vehicles, Orbital flight paths.) (High frequency, *Radio waves, Refraction, Reflection.) (Radio signals, *Ionospheric propagation, Numerical methods and procedures, Partial differential equations.) (Electrons, Density, Magnetic fields, Terrestrial magnetism.)

An analysis was made of some effects of the ionosphere on HF observations from satellite-borne radio telescopes. A search was conducted for focusing effects of the ionosphere on incoming cosmic noise in the HF band. The analysis covers a variety of cases, of interest for satellites in various orbital altitudes and with a wide range of observation frequencies. In this preliminary analysis, the ionosphere was considered to be a non-homogeneous, nonisotropic, magnetoionic medium. The electron-density profile in the calculations is illustrated. The earth's magnetic field was assumed to be dipole in nature. Ionospheric irregularities and discontinuities only for cases in which these disturbances are much larger in size than are the wavelengths considered. The effects of the ionosphere on incoming radiation was computed by employing a Hamiltonian optics approach. The necessary numerical procedures involved in the ray-tracing in relation to a program suitable for use in an IBM-7090 computer are discussed. Rays were computed and plotted for sources located at infinity and frequencies in the band 1-30 mc. (Author)

AD-264 924 Div. 8, 14
(TIPSE/CRJ) OTS price $3.60

General Electric Co., Schenectady, N. Y.
INVESTIGATION FOR THE DEVELOPMENT OF CERAMIC BODIES FOR ELECTRON TUBES,
by H. R. Wisely. 13 Sep 61, 31p. incl. illus. tables (Scientific rept. no. 4)
(Contract AF 19(604)7410)
(AFCRL-774) Unclassified report

DESCRIPTORS: (*Electron tubes, *Ceramic materials, Alkaline earth compounds, Spinels, Minerals, Silicates, Silicon compounds, Dioxides, Calcium compounds, Magnesium compounds, Oxides.) (Quartz crystals, Synthesis.) (Aluminum compounds, Oxides, Stabilization.)

Experimental work was devoted to the following: (1) synthesis of microcrystalline quartz; (2) Attempted stabilization of gamma-Al2O3; (3) further study of the firing behavior of the moderate thermal expansion alkaline-earth silicate diopside, the high expansion merwinite, and silica-stabilized CaO:MgO; and (4) initial study of the thermal expansion behavior of members of several solid-solution series. (Author)

AD-264 928 Div. 8, 15
(TIPSP/MFA) OTS price $4.60

Hebrew U. (Israel).
THE THEORY OF DEFINITE AUTOMATA,
by M. Perles, M. O. Rabin, and E. Shamir.
Aug 61, 43p. (Technical rept. no. 6)
(Contract N62558-2214)
Unclassified report

DESCRIPTORS: (*Automation and *Information theory of Circuits and Electrical networks.)

(Sequential analysis, Metamathematics, Algebras, Combinatorial analysis.) (Computers, Computer logic, Coding.)

The notion of a definite event introduced by Kleene as well as the related concepts of definite automata and tables are studied in detail. Results relating to the minimum number of states required for synthesizing an automaton of a given degree of definiteness are proved. Various decision and synthesis problems pertaining to definite automata are effectively solved. (Author)

AD-265 011 Div. 8, 25, 30
(TIPSM/EJH) OTS price $1.10

Ohio State U. Research Foundation, Columbus.
THE MECHANISM OF OXIDE FORMATION IN THE INITIAL STAGES OF OXIDATION.
Quarterly rept. no. 5, 1 July-30 Sep 61,
by D. W. Rausch, K. L. Moazed and M. G. Fontana. 16 Oct 61, 2p.
(Contract DA 33-019-ORD-3387)
Unclassified report

DESCRIPTORS: (*Tungsten, *Tungsten wire, *Tantalum, Wire, Chemical reactions, *Oxidation, Oxides, Field emission.) (Adsorption, Gases, Gas diffusion, High temperature research, Vacuum apparatus, Microscopes, Electron tubes, Low pressure research.)

Field-emission runs were made with W and Ta emission tips reacting with residual gases in the vacuum system. Of particular interest was the speckled emission pattern from W tips which had been observed after exposure at elevated temperatures. Exposure to residual gases at lower temperatures did not produce the speckled high temperature pattern. An initially clean W tip was exposed to residual gases and gettering for 81 hours. This contaminated tip was then cleaned by heating. This cleaned tip was then exposed to residual gases at ambient temperature. Subsequent heating to about 2100 C for 60 minutes did not produce a clean tip. It has been noted that Ta emission tips are considerably more difficult to clean than W tips. Field-emission reaffirmed this observation and indicated on occasion that the emission tip produces multiple patterns. Subsequent examination of these tips in the electron microscope showed some tips contain small projections and are generally not as smooth as would be desirable. (Author)

AD-265 013 Div. 8
(TIPSE/CRJ) OTS price $1.60

RCA Defense Electronic Products, New York.
BROADBAND S-BAND REACTANCE AMPLIFIER.
Quarterly progress rept. no. 4, 1 Apr-30 June 61, by R. Pettai and B. Bossard. 1 Aug 61, 15p. incl. illus. (Rept. no. CR-61-419-1D)
(Contract DA 36-039-sc-85058, Proj. 3A99-21-001-01)
Unclassified report

DESCRIPTORS: (*Microwave amplifiers, S band, Broadband, Design.) (Radiofrequency filters, Low pass filters, Waveguide filters, Standing wave ratios, Measurement, Design.) (Waveguides, Transmission lines, *Diodes, Coupling circuits, Microwave equipment.) Amplifiers, Electron tubes, Electronic circuits, Semiconductors.

The all waveguide parametric upconverter was fabricated and tested. Although broadband interaction was obtained, no net gain was achieved. These unsatisfactory results are attributed to higher mode leakage into the signal circuit. A new model is being designed using a coaxial signal circuit which should eliminate the mode problem. Preliminary measurements were made on a 2 diode circulator coupled paramp. A net gain of 2db was obtained over a 180mc bandwidth. A balanced coaxial paramp employing a structure originally conceived at Airborne Instruments Laboratory was designed. (Author)

AD-265 020 Div. 8
(TIPSE/CRJ) OTS price $1.60

Tracerlab., Inc., Waltham, Mass.
STATISTICAL CONSIDERATIONS APPLICABLE TO COMMUNICATION SYSTEMS UTILIZING DISCRETE QUANTA,
by Joris M. Brinkerhoff. 2 Aug 61, 14p. incl. illus.
(Contract AF 30(602)2189, Proj. 4519)
(RADC TN 61-155) Unclassified report

DESCRIPTORS: (X rays, *Communication systems, Data transmission systems.) (*Communications theory, Statistical analysis.) (*Pulse integrators, Mathematical analysis.)

The conditions for optimum signal reception are considered. It is shown that the optimum receiver will display various weighted running averages of the number of counts received. The forms of weighting factors are quantitatively considered according as to whether the background is low or high, and if it is high, whether it is known or unknown, whether extraneous signals are assumed to be present, and if so, the degree to which attempts are made to correct for them. The optimum shape for a single bit of information is then considered over the same set of conditions. A design of electronic apparatus proposed as suitable for optimum signal recognition is described and consists of a pulse integrator of arbitrary waveform, the latter being achieved as a weighted sum of successively higher order Poisson functions. A discussion of the statistical effects of x-ray coherence phenomena is appended, and these are seen to have a negligible influence on the behaviour of any realistically envisioned x-ray communications system. (Author)

AD-265 059 Div. 8, 25
(TIPSP/JW) OTS price $6.60

Aerospace Corp., Los Angeles, Calif.
PRELIMINARY CALCULATIONS ON THE PLASMA OF A HELIUM-NEON LASER,
by Roy C. Ward. Sep 61, 61p. incl. illus. 32 refs. (Rept. no. TDR-930(2250-20)TN-1)
(Contract AF 04(647)930)
Unclassified report

DESCRIPTORS: (*Masers, *Microwave oscillators, Microwave amplifiers, Optics, Excitation, *Plasma physics, Gases, Helium, Neon.) (Diffusion, Electrons, Density.) Rare gases.

Calculations are presented on the rf-excited plasma in a laser which generates 15 milliwatts of coherent cw radiation at 11,530 A. Estimates are given of the average electron concentration, the electron energy distribution, the atom temperature, and the populations of the maser levels. The nature of the ambipolar diffusion

process in the plasma is treated in some detail. Significant conclusions reached in the study are discussed. The electron energy distribution differed markedly from a Maxwellian one. If a clean quartz or glass tube were used, it was likely that the atom temperature was markedly higher than room temperature; if so, increasing the thermal accommodation coefficient by coating the inner wall of the tube should improve overall performance. The laser plasma (in a mixture of He at 1 mm Hg and Ne at 0.1 mm Hg) is not amenable to the usual treatment of ambipolar diffusion; in particular, the positive-ion concentration near the wall is not negligible. Increasing the strength and the output impedance of the rf exciter might be beneficial. Consideration of the nature of ambipolar diffusion furnishes a simple explanation of the fact that ion temperatures determined by Langmuir probes in low-pressure gas discharges are sometimes implausibly high. (Author)

AD-265 078 Div. 8, 26
(TIPSE/CRJ) OTS price $2.60

Bliley Electric Co., Erie, Pa.
PRODUCTION ENGINEERING MEASURE QUARTZ CRYSTAL UNITS CR-(XM-40)/U (2.5 MC HIGH PRECISION).
Quarterly progress rept. no. 1, 29 May-31 Aug 61, by J. M. Wolfskill, R. T. Schlaudecker and Robert Mouck. 31 Aug 61, 27p. incl. illus. table.
(Contract DA 36-039-sc-85958)
Unclassified report

DESCRIPTORS: (*Crystal oscillators, Quartz resonators, Quartz crystals, *Manufacturing methods, Preduction, Tests, Test methods.) (Frequency, Standards, Crystals.) (Aging, Temperature, Stability, Measurement.)

Preparations are presented for the production engineering measure study on CR-(XM-40/U quartz crystal units. The approach to this project is to fabricate engineering sample units, modify them as necessary to meet the specific requirements, then to obtain preproduction approval and to conduct a pilot run production. The CR-(XM-40)/U are high precision quartz crystal units at 2.5 mc. A calibration tolerance of + or - 1.5 c at operating temperature is listed, and a maximum aging rate of 5 parts in 10 to the 10th power per day (after 21 days) is specified. Engineering samples, not yet evaluated, use plano-convex, polished crystals which are just under 1 3/16 inches in diameter. Evaporated gold electrodes are utilized and the crystals are horizontally mounted, at 3 equally spaced points along the periphery. Units are sealed in high vacuum in T 11 glass envelopes. (Author)

AD-265 104 Div. 8, 7
(TIPSP/WH) OTS price $4.60

Case Inst. of Tech., Cleveland, Ohio.
CASCADE SYNTHESIS OF TWO ELEMENT KIND NETWORKS,
by James D. Schoeffler. 5 Sep 61, 47p. incl. illus. (Technical rept. no. 1)
(Contract Nonr-114110, Proj. 375-370)
Unclassified report

DESCRIPTORS: (*Electrical networks, Analysis, Transmission lines, *Circuits, Synthesis.)

Realization of a two element kind network in the form of a cascade connection of subnetworks each of which places in evidence one or more sets of transmission zeros is discussed. A new technique for achieving this realization based on the use of an intermediate three element kind network is presented. This approach makes feasible zero shifting in order to arrive at subnetworks which are realizable in unbalanced form without mutual coupling. The design procedure is outlined in detail. (Author)

AD-265 105 Div. 8, 4, 14
(TIPSM/SEB) OTS price $1.10

CBS Labs., Stamford, Conn.
RESEARCH AND INVESTIGATION ON PHOSPHOR SCREENS FOR HIGH RESOLUTION DISPLAY DEVICES.
Interim engineering rept. no. 1, 12 June-31 Aug 61,
by R. E. Rutherford, Jr. 23 Oct 61, 4p. incl. illus. (Rept. no. 114)
(Contract AF 33(616)8509)
Unclassified report

DESCRIPTORS: (*Display systems, *Cathode ray tube screens, *Fluorescent screens, *Phosphors, Measurement, Preparation, Test methods.) (Deposits of Calcium compounds, Magnesium compounds, Silicates, Cerium on Glass.) Electrodeposition, Cathode ray tubes.

Research and investigation has been undertaken leading to the development of phosphor screens for high resolution display devices. The program is limited to the development of material processing and screen generation techniques using available materials. The general objective is to develop the techniques of using available materials to generate a luminescent screen capable of transferring information at a rate equivalent to a bandwidth of 15 mc with S/N of 30 db and with a peak radiant intensity sufficient to expose high resolution film through a high quality optical system of f:4. Phosphor screens were prepared to provide a basis of comparison for the development work. Methods used to deposit coatings of P16 phosphor, CaMg(SiO4):Ce included spraying using a volatile vehicle, settled from a liquid suspension and electrodeposited from a liquid suspension. (Author)

AD-265 142 Div. 8
(TIPSE/CRJ) OTS price $6.60

Electronic Defense Labs., Mountain View, Calif.
MECHANICAL DESIGN AND DEVELOPMENT OF LIGHTWEIGHT ANTENNA REFLECTORS AND POSITIONING DEVICES.
PART 3. THE ANPOD, A NEW TYPE OF ANTENNA POSITIONING DEVICE,
by Mack Suliteanu. 20 July 61, 65p. incl. illus. tables (Technical memo. no. EDL-M350, pt. 3)
(Contract DA 36-039-sc-85402)
Unclassified report

DESCRIPTORS: (*Radar antennas, Radar reflectors, *Servo systems, Control systems, Design.) (*Antenna hardware, *Antenna masts, Stability, Load distribution, Costs, Transportation, Design.) Antennas, Mechanical properties, Reflectors.

This effort on the mechanical design and development of lightweight antenna reflectors and positioning devices includes descriptions of the mechanical design and a Servo-Control System for a new type of antenna positioning device (ANPOD). After the kinematic and dynamic requirements are discussed and established, certain idealizations, assumptions, and variables are outlined. The

variables are mathematically determined and equated. The requirements of the static load of the system are analyzed and established in both table form and in equations. A brief study of the Servo-Control System and a few of the associated problems was made. An evaluation between the development, fabrication, costs, performance, and installation of a conventional pedestal and the ANPOD device confirmed the original premise that the ANPOD design concept has the greater simplicity, and provides a system capable of being accurately controlled, with good reflector structural support, low weight, and the ability to be stowed during wind conditions. The ANPOD can be standardized for an appreciable range of sizes, and is easily transported to and installed at the operating site. (Author)

AD-265 157 Div. 8
(TIPSE/DLW) OTS price $2.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
PULSE DRIVER FOR MILLIMICROSECOND FERRITE SWITCH,
by Eugene J. Malloy. 20 June 61, 12p. illus.
(Research rept. no. PIBMRI-925-61)
(Contract AF 30(602)2135)
(RADC TN 61-192) Unclassified report

DESCRIPTORS: (*Waveguide switches, Electronic switches, Ferrites, *Phase shifters, Transmission lines, Microwave equipment, Design.) (Microwaves, X band, Switching circuits.) (*Pulse generators, Power supplies, Modulators, Magnetic modulators, Pulse transformers, Waveform generators, Ferromagnetic materials, Tests.)

The results of experiments in the switching time of an X-band ferrite circulator are given. A design for the pulse driver needed to obtain fast switching time is included and some microwave application are mentioned briefly. (Author)

AD-265 164 Div. 8
(TIPSE/DLW) OTS price $6.60

General Electric Co., Syracuse, N. Y.
TUNNEL DIODES AND TUNNEL JUNCTION DEVICES FOR HIGH FREQUENCY. HIGH POWER OPERATION.
Final rept., 1 July 60-30 June 61.
30 June 61, 66p. incl. illus. tables, 13 refs.
(Contract NObsr-81320)
Unclassified report

DESCRIPTORS: (*Diodes, *Microwave oscillators, Microwave equipment, *Oscillator circuits, Ultra high frequency, Electronic circuits, Effectiveness, Failure (Mechanics), Tests, Design.) (Diodes, Gallium compounds, Indium compounds, Arsenides, Germanium, Alloys, Hall effect, Electrostatic capacitance, Resistance, Measurement.) Oscillators.

The development of tunnel diodes for use as oscillators capable of mW output at frequencies up to 3 kmc is described. Investigations on the failure of gallium arsenide units were made with no conclusive result. Experiments with different types of alloys were carried out in an effort to reduce the junction capacitance in germanium tunnel diodes. A low inductance - low capacitance modified stripline package was developed. The operation of oscillators using high current tunnel diodes above their self resonant frequency is presented. General stability conditions of the tunnel diode including external circuits (lumped and distributed) are discussed. Based on a non-linear analysis of a tunnel diode oscillator, the power generated by the diode, the power dissipated within the diode, and the power delivered to an external load are calculated as a function of frequency and loading conditions. (Author)

AD-265 169 Div. 8, 26
(TIPSE/DLW) OTS price $2.60

General Electric Co., Schenectady, N. Y.
SOLID TANTALUM CAPACITOR.
Quarterly engineering rept. 1 July-30 Sep 61.
30 Sep 61, 30p. incl. illus. tables.
(Contract NObsr-85470)
Unclassified report

DESCRIPTORS: (*Electrolytic capacitors, *Tantalum capacitors, Foamed metals, Anodes (Electrolytic cell), Oxides, Manganese compounds, Chemical impurities, Dioxides, Semiconductors, Design, Manufacturing methods, Processing.) (Capacitors, Electrical properties, Surface properties, Life expectancy, Measurement.)

Research is concerned with the design and development of a solid electrolyte tantalum capacitor capable of operation at 100 volts at 85 C. A 20 volt solid electrolyte tantalum capacitor will also be designed which utilizes foamed tantalum as the capacitor anode and is capable of operation at 85 C. (Author)

AD-265 195 Div. 8
(TIPSE/DLW) OTS price $2.60

Melpar, Inc., Falls Church, Va.
AIRBORNE ELECTRONIC SUBSYSTEMS ANALYSIS FOR MOLECULAR ELECTRONICS.
Interim scientific rept. on Phase III for 20 Feb-20 Aug 61,
by Joseph N. Goeser. 20 Aug 61, 25p.
(Contract AF 33(616)7364)
Unclassified report

DESCRIPTORS: *Electronic equipment, *Electronic circuits, Airborne, Statistical analysis.

A statistical analysis is to be made for molecular electronics use of the functional characteristics of airborne electronic subsystems, equipments and circuits. A survey and analysis of circuits in subsystems and equipments now under development and just emerging from the laboratories was initialed to determine the direction being taken in airborne electronic development. (Author)

AD-265 221 Div. 8
(TIPSE/DLW) OTS price $3.60

Washington U. Coll. of Engineering, Seattle.
FREQUENCY SCANNING ANTENNAS,
by Akira Ishimaru and Hang-Sheng Tuan. Apr 61,
35p. incl. illus. (Technical rept. no. 54)
(Contract AF 19(604)4098)
(AFCRL-711) Unclassified report

DESCRIPTORS: (*Antennas, Electronic scanners, Phase shifters, Linear systems, Antenna radiation patterns, Phase measurement, X band, Mathematical analysis, Theory, Electromagnetic theory.)

The theory is presented of 180 degree scanning for a linear array and Tchebyscheff array by frequency variation and the relationships between the linear array theory and the diagram of periodic structures is discussed. Each element is excited by an equivalent slow wave structure which is either non-dispersive or dispersive. At a center frequency, the spacing is an integral multiple of guide wavelength. For a given frequency range, the necessary phase velocity and other parameters are determined in order to obtain 180 degree scanning without causing other main beams. An example is carried out for the X-band frequency range. (Author)

AD-265 276 Div. 8, 7, 15
(TIPSP/WH) OTS price $9.60

Microwave Research Inst., Polytechnic Inst. of Brooklyn, N. Y.
STABILIZATION OF MULTILOOP SYSTEMS VIA THE SENSITIVITY FUNCTION,
by R. Haddad. 30 Aug 61, 120p. incl. illus. tables (Research rept. no. PIBMRI-944-61)
(Contract AF 18(603)105)
(AFOSR-1420) Unclassified report

DESCRIPTORS: (*Servo systems, Servo mechanisms, *Feedback, Circuits, Electrical networks, Design, Stabilization, Sensitivity.) Theses, Mathematical analysis, Topology, Algebra.

The stabilization of multiloop systems against individual variations in one or more of the system parameters is studied. A correlation between the stability of a multiloop configuration and the real-frequency behavior of the sensitivity function is derived. From this relationship, a set of stability margins is developed which provide a quantitative measure of the destabilizing effects of variations in each parameter. The margins, referred to as parameter gain and phase margins are shown to be generalizations of the familiar gain and phase margins of the single-loop, servo system. The design objective is the realization of a set of specified stability margins; the relationship between these margins and the real-frequency behavior of the associated sensitivity functions gives rise to specification of the sinusoidal response of compensation networks at a set of discrete frequencies. (Author)

AD-265 294 Div. 8
(TIPSE/DLW) OTS price $4.60

Sperry Gyroscope Co., Great Neck, N. Y.
TRAVELING-WAVE TUBE MIXER PROGRAM.
Interim engineering rept. no. 1, 1 Apr-30 June 61, by I. Itzkan, L. Magill, and G. R. White. Sep 61, 50p. incl. illus. 58 refs. (Rept. no. NA-8210-8283-1)
(Contract AF 33(616)8074)
Unclassified report

DESCRIPTORS: (*Traveling wave tubes, *Crystal mixers, *Parametric amplifiers, Microwave amplifiers, Extremely high frequency, Noise (Radio), Reduction, Design, Feasibility studies.) (Parametric amplifiers, Electron Beams, Traveling wave tubes, Kylstrons, Silicon, Rectifiers, Diodes, Crystals, Solid state physics, Ferrites, Space charges, Electromagnetic waves, Analysis.)

Research is concerned with establishing design feasibility of a uni-envelope, single-electron beam device incorporating as many of the following functions as practicable: (1) low-noise r-f amplification, (2) local oscillation, (3) frequency mixing, and (4) IF amplification. A brief analysis is made of mixers in general, and a description is presented of the various specific approaches which are applicable to the solution of the problem of providing, within a single envelope, a device which will provide low noise amplification and frequency down conversion for millimeter input signals. Some preliminary experimental results are discussed which relate to 2 of the approaches and a general literature survey is included which provides background for the state of the art. (Author)

AD-265 297 Div. 8
(TIPSE/DLW) OTS price $6.60

Radio Corp. of America, Harrison, N. J.
THE DESIGN AND DEVELOPMENT OF ONE-HALF WATT HEATER POWER REDUCED SIZE NUVISTOR TRIODE.
Interim development rept. no. 3, 1 Jan-31 Mar 61, by W. J. Helwig and G. M. Rose, Jr. 31 Mar 61, 64p. incl. illus. tables.
(Contract NObsr-81478)
Unclassified report

DESCRIPTORS: (*Triodes, *Miniature electron tubes, Electron tube heaters, *Microwave amplifiers, Radiofrequency amplifiers, Noise (Radio), Reduction, Oscillator circuits, Design, Electrical properties, Vibration, Life expectancy, Radiation effects, Resonance, Reliability, Tests.) Amplifiers, Electron tubes.

Samples of the type A15200 nuvistor triode were made and subjected to rather extensive evaluation. Heater power was fixed at 450 milliwatts although operation at much lower heater inputs is possible with reduced ratings. Small-signal RF amplifier measurements indicated very good performance with optimum noise factors below 10 db at 900 mc. Evaluation in oscillator circuits showed the type A15200 to be exceptionally stable with respect to applied voltages and the samples demonstrated good uniformity from tube-to-tube. The electrical performance of the type A15200 makes it applicable to low plate voltage supply service. Vibrational tests of the A15200 showed noise outputs at three regions in the spectrum due to heater bounce, cathode structure resonance and grid resonance but these outputs are not considered excessive. Life tests indicate a probably 1000 hour life with the present processing methods. (Author)

AD-265 304 Div. 8, 25
(TIPSP/WH) OTS price $3.60

Stanford Electronics Labs., Stanford U., Calif.
DESIGN THEORY OF A SURFACE-FIELD-EFFECT TRANSISTOR.
Rept. for Jan 61-July 61, on Research in Physical Phenomena and Microelectronics,
by H. K. J. Ihantola. Sep 61, 30p. incl. illus.
(SEL technical rept. no. 1661-1)
(Contract AF 33(616)7726, Proj. 4159)
(ASD TN 61-133) Unclassified report

DESCRIPTORS: (*Transistors, Surfaces, Electric fields, *Conductivity, Theory.) (Semiconductors, Electrical properties.)

When a strong, perpendicular electric field is applied on a semiconductor surface, the surface conductivity is changed. When the field vector is toward the surface and the material is p type, an n-type inversion layer is created, resulting in n-type surface conductivity. The theory of the shape of induced inversion and depletion regions (Phys. Rev., 99:376, 1955) is reviewed and simplified. The new approach allows a non-equilibrium potential between the semiconductor and its surface. By means of the simplified theory, the surface conductivity is calculated. The inversion phenomenon can be used to modulate the channel conductance of a field-effect transistor. This new type of field-effect transistor is described. The theory of the creation of the inversion layer is used to relate the dimensions of a surface-field-effect transistor to its electrical properties. The design theory of transistors with rectangular channels is developed. These transistors consist of a thin oxide layer on the surface of a p-type-silicon region between two pn junctions. With a metal layer on top of the oxide layer, a high field can be produced to create an inversion (n-type) layer within the p region. This inversion layer provides a conducting path between the junctions. (Author)

AD-265 305 Div. 8
(TIPSE/DLW) OTS price $1.60

Sperry Gyroscope Co., Great Neck, N. Y.
BEAM-TYPE PARAMETRIC AMPLIFIER.
Technical note no. 2, 1 Apr-30 June 61.
July 61, 25p. incl. illus. (Rept. no. NA-8210-8264-2)
(Contract AF 30(602)2433)
(RADC TN 61-197) Unclassified report

DESCRIPTORS: (*Parametric amplifiers, Microwave amplifiers, Broadband, C band, X band, K band, Narrowband, Electron guns, Noise (Radio), Reduction, Waveguides, Design.) (Electron beams, Cooling.) (Electron tubes, Magnetic fields, Impedance, Waveguide couplers, Coupling circuits, Helixes, Phase measurement, Tests.) Amplifiers.

The initial low-noise gun and beam refrigeration apparatus were tested. Test results for a broadband double-helix coupler and a narrow-band double zig-zag line coupler are given. The helix coupler was shown to be superior. Tests of quadrupole mode pattern for the pump circuit were completed. Initial tests for the 30-kmc idler stripper circuit were performed. Tentative design calculations are given for the degenerate operation. A prospective design for the nondegenerative operation is discussed. (Author)

AD-265 320 Div. 8
(TIPSB/MS) OTS price $1.10

Vitro Labs., West Orange, N. J.
GENERAL USAGE ASSEMBLIES FOR NAVY ELECTRONIC EQUIPMENT.
Quarterly progress rept. no. 19, 1 Jan-31 Mar 61. 1 May 61, 6p. incl. table. (Rept. no. VL-2062-6-0)
(Contract NObsr-72538)
Unclassified report

DESCRIPTORS: (*Electronic equipment, Naval equipment, *Electronic circuits, Electron tubes, Amplifiers, Oscillators, Transistors, Distributed amplifiers, Life expectancy, Reliability, Tests, Specifications.)

AD-265 347 Div. 8, 2
(TIPSP/MFA) OTS price $2.60

Stanford Electronics Labs., Stanford U., Calif.
CALCULATIONS OF SIGNAL-TO-NOISE RATIOS FOR SOLAR RADAR ECHOES,
by P. Yoh. 18 July 61, 25p. incl. illus.
(Scientific rept. no. 2)
(Contract AF 19(604)7436)
(AFCRL-739) Unclassified report

DESCRIPTORS: (*Signal-to-noise ratio, Data, *Solar noise, *Extraterrestrial radio waves, Radio interference, Solar corona, Radar echo areas, Magnetic fields, Radiofrequency, Refraction, Refractive index, Radio astronomy, Temperature, Brightness, Absorption, Measurement.) (Quantum mechanics, Equations, Integrals.)

The procedure for computing the signal-to-noise ratio of radar echoes from the sun is outlined. The radial distribution of electron density in the corona, the coronal temperature, solar noise, galactic noise, and radar-system parameters are taken into account. Examples are given of computations for two sola radar systems that will soon be in operation. (Author)

AD-265 357 Div. 8, 14, 20
(TIPSB/CCH) OTS price $1.60

Stevens Inst. of Tech., Hoboken, N. J.
UNCLASSIFIED LITERATURE SURVEY ON EFFECTS OF NUCLEAR RADIATION TO ELECTRON - TUBE MATERIALS.
Quarterly rept. no. 3, 1 May-31 July 61,
by E. R. Johnson. 31 July 61, 16p. (Rept. no. 5735-3)
(Contract DA 36-039-sc-87382)
Unclassified report

DESCRIPTORS: (Literature, Conferences on Radiation effects, *Radiation damage of Neutrons on *Electron tubes, Materials, Radioactivity.) (Dosage, Measurements by Dosimeters of *Gamma rays on Dielectric properties, Glass textiles, Magnetic materials, Ferrites, Ceramic materials.) Neutron bombardment, *Gamma neutron reactions.

The importance of shock vibration testing of irradiated electron tubes is reemphasized. A new dosimeter for absolute energy absorption measurements is reported. Chemical reactions occurring in an operating tube are discussed. (Author)

AD-265 360 Div. 8
(TIPSE/HD) OTS price $8.10

Westinghouse Electric Corp., Pittsburgh, Pa.
HEAT DIODE CONVERTER,
Interim scientific rept. no. 1, 1 May-31 July 61. 20 Aug 61, 86p. incl. illus.
(Contract AF 33(616)8262)
Unclassified report

DESCRIPTORS: (*Thermoelectricity, Electric power production, Space flight.) (Diodes, Seals, Life expectancy.) (Life expectancy, Space changes, *Thermionic emission, *Diodes, Voltage, Distribution, Cesium.) (Electrons, Scattering, Cesium, Atoms.) (Refractory materials, Metals, Cesium, Vapors, Electrons, Thermionic emission, Tantalum, Molybdenum.)

Contents:
emission of cesium coated refractory metals
Scattering of electrons by Cs atoms
Space charge limited currents in thermionic diodes at high cesium pressure
Potential distributions in high pressure cesium thermionic diodes

Thermionic diodes, carnot efficiency, and anomalous Richardson constants
Theoretical efficiencies of thermionic diodes
Life testing of seals for thermionic diodes

AD-265 363 Div. 8, 25
(TIPSP/WH) OTS price $9.10

Westinghouse Electric Corp., Pittsburgh, Pa.
SOLID STATE JUNCTION FAST NEUTRON SPECTROMETERS,
by R. V. Babcock, J. D. Reichert, and S. L. Ruby.
Aug 61, 107p. incl. illus. 27 refs.
(Contract AF 29(601)2770, Proj. 8802)
(AFSWC TR 61-57) Unclassified report

DESCRIPTORS: (*Semiconductors, Solids, *Lithium compounds, Fluorides, *Neutron counters, Neutron flux density, Fast neutrons.) (Thorium, Uranium, Radioactive isotopes.) (*Neutron cross sections, Spectrographic analysis, Instrumentation, Nuclear reactions.) (Carbon, Recoil atom.)

Possible fast neutron spectroscopy systems using P-N junctions were investigated. Combinations of fast fission threshold counters exhibited useful energy dependencies. As part of this evaluation, fission cross sections of Th-232 and U-234 in the 12 to 18 Mev range were measured. Li-6F spectrometers exhibited excellent energy resolution. To extend their value, the Li-6(n,alpha)H-3 cross section was measured in the range 0.75 to 1.65 Mev. A carbon recoil method for large neutron fluxes also showed promise. A system using the Li-6F device in the range 0 to 8 Mev and carbon recoil at higher energies is recommended. Where less resolution is needed the fast fission system is more sensitive. (Author)

AD-265 414 Div. 8, 6
(TIPSE/DLW) OTS price $5.60

Naval Research Lab., Washington, D. C.
ANTENNA AND RECEIVING-SYSTEM NOISE-TEMPERATURE CALCULATION,
by L. V. Blake. 19 Sep 61, 50p. incl. illus. tables, 28 refs. (NRL Rept. 5668)
Unclassified report

DESCRIPTORS: (*Antennas, Antenna radiation patterns, Noise (Radio), Noise (Radar), Very high frequency, Superhigh frequency, Ultra high frequency, Temperature, Measurement.) (*Radar receivers, *Radio receivers, Radar signals, Radio signals, Signal-to-noise ratio, Mathematical analysis.)

A calculated curve representing the noise temperature of a typical directive antenna in the frequency range 100 to 10,000 mc is presented, together with the method and details of calculation. A methodology for utilizing this antenna noise temperature in calculation of a receiving-system noise temperature, from which the total system noise power output and the signal-to-noise power ratio may conveniently be computed is given. The use of system noise temperature for comparing the low-noise merit of different systems is discussed. The calculation of received signal power for various types of systems (one-way radio, monostatic and bistatic radar, satellite-reflection communication) is briefly reviewed, to show how the system noise temperature may be used for signal-to-noise-ratio calculation. (Author)

AD-265 429 Div. 8
(TIPSE/WAW) OTS price $3.60

Sylvania Electric Products, Inc., Emporium, Pa.
(No title).
Quarterly interim engineering rept. no. 4, 1 Apr-30 June 61,
by Robert J. Bisso. 30 June 61, 38p. incl. illus. tables.
(Contract NObsr-81552)
Unclassified report

DESCRIPTORS: (Electron tubes, *Miniature electron tubes, *Subminiature electron tubes, Design, Tests, Life expectancy.) (*Cathode followers, Video amplifiers.)

Type SN-2967A: The static characteristics of Test F8159 were extremely close to the target objectives. Zero bias plate current will be increased 20 ma to meet the desired 120 ma level by a change in grid TPI. Pulse life tests and pulse performance are both satisfactory and cathode follower linearity continues to be acceptable. Static life test performance will require additional improvement. Materials and processing methods are being investigated. Type SN-2968A: Life tests with carbonized plate material are satisfactory. Heater current will be increased and grid TPI reduced to center Mu to improve zero bias plate current. (Author)

AD-265 430 Div. 8, 25, 26
(TIPSE/DLW) OTS price $3.60

Transitron Electronic Corp., Wakefield, Mass.
RESEARCH AND DEVELOPMENT ON HIGH PURITY SILICON CARBIDE CRYSTALS, SiC JUNCTIONS AND SiC ACTIVE DEVICES.
Final engineering rept., 27 Feb 59-31 Jan 61,
by Max Gloor. 31 Jan 61, 38p. incl. illus.
(Contract AF 19(604)4989)
(AFCRL-901) Unclassified report

DESCRIPTORS: (Silicon compounds, Carbides, *Single crystals, *Semiconductors, Thin films, *Diodes, Refractory materials, Vapors, Growth.) (Crystals, Electrical properties, Chemical impurities, Resistance, Temperature, Measurement.)

By growing epitaxial layers of silicon carbide from the vapor phase onto single crystal platelets, P-N junctions were produced with reverse breakdown voltages up to 400 volts throughout the temperature range from 25 to 500 C. A closed graphite crucible provided the environment for evaporation for silicon carbide and condensation of the vapor on the cooler hexagonal crystal platelet. Generally, the grown epitaxial layers were hexagonal; although, cubic deposits can be formed by proper choice of temperature and pressure variables. The intrinsic silicon carbide layers are transparent, pure, and possess a high resistivity. They are formed by the sublimation of a very pure silicon carbide charge. By the use of an aluminum doped charge, P-type layers were deposited which were overdoped by the introduction of nitrogen during the growth process. In this way, P-N junctions were formed with satisfactory reverse breakdown characteristics. The high resistivity of the substrate platelets, however, prevented diodes from showing attractive forward characteristics. (Author)

AD-265 449 Div. 8
(TIPSP/WFA) OTS price $1.10

Navy Underwater Sound Reference Lab., Orlando, Fla.
TRANSDUCER CALIBRATION FROM NEAR-FIELD DATA.

by W. James Trott. 6 Oct 61, 7p. (USRL research rept. no. 55)

Unclassified report

DESCRIPTORS: (Theory, *Transducers, Calibration, *Field emission, Pressure, Electrostatics, Electromagnetic waves, Impedance, Electric potential, Computers, *Mathematical computer data, Integrals.)

The theory for obtaining free-field sensitivities and transmitting responses of line or piston-type transducers from near-field data and the equations for obtaining the directivity, transmitting or receiving, from near-field data are derived. The set-up and adjustment of the type CF4 Fourier Integral Computer for computing the data are described and the data that must be obtained are listed. (Author)

AD-265 452 Div. 8
(TIPSW/RD) OTS price $8.10

Army Signal Research and Development Lab., Fort Monmouth, N. J.
ATOMIC CLOCKS AND THEIR APPLICATIONS,
by F. H. Reder. Oct 61, 82p. incl. illus. tables, 110 refs. (ASRDL Technical rept. no. 2230)

Unclassified report

DESCRIPTORS: Vibration, Atoms, *Frequency, *Standards, Stability, Frequency dividers, Ammonia, *Masers, Hydrogen, Gases, Cesium, Rubidium, Measurement, Quartz crystals, Resonance.

Atomic clocks consist of electronic frequency dividers and electromechanical integrators which are driven by an atomic frequency standard. The following topics are reviewed: criteria for the selection of useful atomic spectral lines; conversion of output frequencies from one to other time scales; advantage of integral over proportional servo control; criteria for performance description of atomic frequency standards; perturbations of output frequencies; tunability of atomic standards; synchronization errors caused by frequency offset and instability; perturbing influences of dividers and measurement techniques; principles and performance data on various atomic frequency standards, namely, conventional NH_3 maser, hydrogen maser, other maser schemes, Rb and Cs gas cell standards, and Cs beam standards; and applications for frequency measurement and for time measurement both with single and separated synchronized clocks. (Author)

AD-265 453 Div. 8
(TIPSE/NTM) OTS price $3.60

Andrew Corp., Chicago, Ill.
FLEX-EXPANSION SECTION, COAXIAL, 3-1/8 INCH.
Final engineering rept.
12 May 61, 32p. incl. illus. tables.
(Contract NObsr-81413)

Unclassified report

DESCRIPTORS: (*Coaxial cables, *Transmission lines, Standing wave ratios, Measurement, Design, Expansion joints, Flexible couplings, Manufacturing methods.)

This is the final report on the design and development of a Flex-Expansion Section, Coaxial, 3-1/8 inch, for the Bureau of Ships, Electronic Division, Department of the Navy. A full report of the design considerations, degree to which the specifications were met and the feasibility of manufacturing the units are included. The methods used to test the section along with the results are shown in full. All except two of the specifications were achieved or exceeded. The force required to expand and compress the unit and insertion loss were the two specifications not met. The degree to which these specifications were met and the limitations they put on the section are explained. Four production type models were furnished to show the manufacturing capabilities of the item. (Author)

AD-265 456 Div. 8
(TIPSE/DLW) OTS price $1.10

Filtron Co., Inc., Flushing, N. Y.
200 C RADIO INTERFERENCE FILTER PROGRAM.
Interim technical engineering rept. no. 5 on phases 1 and 2, 1 Dec 59-1 Mar 61,
by B. R. Birsten. 1 Mar 61, 10p. incl. illus.
(Rept. no. ES-5, addendum to AD-253 265)
(Contract AF 33(600)38324, Proj. DP 1032-1)

Unclassified report

DESCRIPTORS: (*Radiofrequency filters, Radio interference, Quality control, Tests.)

AD-265 487 Div. 8, 4
(TIPSB/CCH) OTS price $.50

Naval Research Lab., Washington, D. C.
SURFACE CHEMICAL METHODS OF DISPLACING WATER AND/OR OILS AND SALVAGING FLOODED EQUIPMENT. PART 2. FIELD EXPERIENCE IN RECOVERING EQUIPMENT DAMAGED BY FIRE ABOARD USS CONSTELLATION AND EQUIPMENT SUBJECTED TO SALT-SPRAY ACCEPTANCE TEST,
by H. R. Baker, P. B. Leach and C. R. Singleterry. 19 Sep 61, 14p. illus. (NRL rept. no. 5680)

Unclassified report

DESCRIPTORS: (*Salvage, Recovery and Cleaning of *Electronic equipment by *Chemicals, Detergents, Wetting agents, Test methods.) (Contamination by Electrolytes.) (Fires, Water, Oils, Smoke, Heat, Salinity.)

The surface chemical techniques previously developed in this Laboratory for the removal of oily and/or electrolyte contamination and the displacement of water from electrical and electronic equipment has been field tested in two major equipment recovery projects. One project was the reconditioning of electronic equipment damaged by water, smoke, and heat during the fire aboard the aircraft carrier CONSTELLATION, and the other was the removal of salt residues from airborne radar equipment after salt-spray environmental testing. Both operations were highly successful. In the course of the work additional cleaning techniques employing more aggressive cleaning chemicals were devised and fitted into the integrated salvage procedure in such a way as to obviate damage from overtreatment and eliminate electrolyte residues otherwise left by aggressive cleaning agents. (Author)

AD-265 489 Div. 8, 2
(TIPSP/MFA) OTS price $1.60

Antenna Lab., Ohio State U. Research Foundation, Columbus.
ON THE THEORY OF HYBRID WHISTLERS,
by H. Unz. 17 Aug 61, 16p. (Rept. no. 1116-10; Scientific rept. no. 6)
(Contract AF 19(604)7270)
(AFCRL-782) Unclassified report

DESCRIPTORS: (Theory of *Extremely low frequency, *Radio signals.) (Radio waves, Terrestrial magnetism, Scattering, Velocity, Wave transmission, Electron beams.) (Equations, Algebra.)

It is suggested that the reason for the multiple, discrete, well-defined components in the nose whistlers is the different electron streams of discrete velocities along the same geomagnetic line. This new hypothesis is discussed in detail, and it is shown that the experimental evidence agrees with the analysis. (Author)

AD-265 496 Div. 8
(TIPSE/DLW) OTS price $2.60

Raytheon Mfg. Co., Newton, Mass.
THE FEASIBILITY OF QUICK WARM-UP AND STABILIZATION OF HEATER-CATHODE TYPE RECEIVING TUBES.
Final rept. 2 Jan 59-31 Dec 60,
by Ross Wood. 31 Dec 60, 22p. incl. illus.
(Contract NObsr-77535)
Unclassified report

DESCRIPTORS: (*Triodes, *Cathodes (Electron tubes), Electron tube heaters, Heating, Stabilization, Design, Feasibility studies.) (Electron tube heaters, Ceramic materials, Temperature, Electrical properties, Manufacturing methods, Production, Life expectancy, Conductivity, Measurement.)

The feasibility was studied of obtaining quick warm-up and stabilization of a triode heater-cathode type receiving tube. The design and development is described of a simple stacked triode type tube employing a ceramic sandwich heater-cathode structure. The advantages offered by the metallized ceramic cathode in good thermal contact with the heater include: (1) the thin ceramic slab serves both as heater-cathode electrical insulation and as the rigid mechanical support for the planar metallizing, thus minimizing thermal storage, (2) operation time is favored by reduction of the thermal capacity of the heater-cathode, and (3) operation time is further reduced by increasing the rate of energy input throughout the heating of the cathode, as a result of conductive transfer. (Author)

9. FLUID MECHANICS

AD-264 740 Div. 9
(TIPSM/BRW) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL INVESTIGATION AT MACH NUMBER 3.0 OF THE EFFECTS OF THERMAL STRESS AND BUCKLING ON THE FLUTTER OF FOUR-BAY ALUMINUM ALLOY PANELS WITH LENGTH-WIDTH RATIOS OF 10,
by Sidney C. Dixon, George E. Griffith, and Herman L. Bohon. Oct 61, 28p. incl. illus. table.
(Technical note D-921)
Unclassified report

Also available from NASA, Wash. 25, D. C. as NASA Technical note D-921)

DESCRIPTORS: (*Airplane panels, Aluminum alloys.) (*Flutter, Stresses, Mach number, Pressure, Aerodynamic heating, Thermal stresses, Buckling, Thermal expansion, Thickness.)

Tests were conducted at dynamic pressures from 1,500 psf to 5,000 psf and at stagnation temperatures from 300 to 655 F. The panels were restrained by the supporting structure in such a manner that partial thermal expansion of the skins could occur. The test results revealed that when a flat panel is aerodynamically heated its susceptibility to flutter increases due to thermal stress, but that when a buckled panel is further heated its susceptibility to flutter decreases. The reversal in the flutter trend for thermally buckled panels is attributed to the panel postbuckling behavior. (Author)

AD-264 742 Div. 9, 14, 1
(TIPSP/WH) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
EXPERIMENTAL AND THEORETICAL DEFLECTIONS AND NATURAL FREQUENCIES OF AN INFLATABLE FABRIC PLATE,
by W. Jefferson Stroud. Oct 61, 27p. incl. illus. (Technical note D-931)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-931.

DESCRIPTORS: (*Pneumatic devices, Sheets, Tests, Deformation, Deflection, *Stresses, *Load distribution.) (*Airframes, Structures, Re-entry vehicles, Satellite vehicles, Hypervelocity vehicles.)

Static and vibration tests were performed on an inflatable square fabric plate supported on all edges. Lateral deflections and natural frequencies showed good agreement with calculations made using a linear small-deflection theory. (Author)

AD-264 817 Div. 9, 15
(TIPSP/WH) OTS price $2.60

Technishe Hochschule, Munich (Germany).
PRACTICAL NUMERICAL METHODS OF THREE-DIMENSIONAL SUPERSONIC FLOW,
Final rept.,
by Robert Sauer. 1 June 61, 25p. incl. illus.
(Contract AF 61(052)377)
(AFOSR-1262) Unclassified report

DESCRIPTORS: (*Gas flow, *Supersonic flow, Numerical methods and procedures, Partial differential equations, Numerical analysis.)

Research pertained to the following: investigations on the numerical methods for non-linear supersonic flow equations (NEWTON-method, extrapolation, streamlines); problems of two-dimensional unsteady non-linear flows (LAVAL-nozzle); numerical methods of hypersonic flow theory (critical investigations of and contributions to existing methods); DORODNICYN's method for the treatment of the blunt body problem. (Author)

AD-264 883 Div. 9
(TIPSP/WH) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF GROUNDBOARD HEIGHT ON THE AERODYNAMIC CHARACTERISTICS OF A LIFTING CIRCULAR CYLINDER USING TANGENTIAL BLOWING FROM SURFACE SLOTS FOR LIFT GENERATION,
by Vernard E. Lockwood. Oct 61, 23p. incl. illus.
(Technical note D-969)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-969.

DESCRIPTORS: (*Aircraft, Aerodynamics, *Ground effect, Cylindrical bodies, *Boundary layer control.) (Lift, Drag, Stability, Ground effect.) Wind tunnels.

Lift and drag measurements were obtained on a semispan circular cylinder having a length-diameter ratio of 4 (aspect ratio 8) and an end plate of 2.5 diameters. The investigation was made to determine to what extent the characteristics are affected by groundboard height. Tests were made over a momentum coefficient range from 0.14 to 4.6 and groundboard height ranging from 1.5 to 10 diameters from the cylinder axis. The test Reynolds number was approximately 290,000. (Author)

AD-264 925 Div. 9, 1
(TIPSA/NTM) OTS price $14.50

General Applied Science Labs., Inc., Hempstead, N. Y.
AERODYNAMIC AND STRUCTURAL ANALYSES OF RADOME SHELLS. VOLUME II. STRUCTURAL ANALYSIS,
by Martin H. Bloom, Dennis Eisen, and others.
Feb 61, 216p. incl. illus. tables.
(Contract AF 33(616)3956, Proj. 4158)
(WADD TR 59-22, vol. 2) Unclassified report

DESCRIPTORS: (*Radomes, Aerodynamics, Aerodynamic heating.) (*Structural shells, Sandwich construction, Mathematical analysis, Structures, Stresses, Tensor analysis, Loading, Pressure, Thermal stresses.) (Ogives, Conical bodies, Hemispherical shells.)

Contents:
Geometry and coordinate definition
Stress-strain and strain-displacement relations
Shell assumptions
Expression of strains in terms of physical displacements
Energy formulation
Elimination of y1 coordinate system dependence by Fourier analysis
Reduction to one-dimensional problem by integration through shell thickness
Boundary conditions
Finite-difference solution technique
Physical boundary conditions at the apex of a nontruncated shell of revolution
Dynamic problems

AD-264 931 Div. 9, 31
(TIPSA/CDM) OTS price $5.60

Hydronautics, Inc., Rockville, Md.
DESIGN CHARTS FOR ONE- AND TWO-STRUT SUPERCAVITATING HYDROFOIL WINGS (WING SERIES A),
by Jakob Auslaender. 1 Oct 61, 50p. incl. illus.
(Technical rept. no. 001-8)
(Contract NObs-78396)
Unclassified report

DESCRIPTORS: (*Hydrofoils, Design, Hydrofoil boats.) (Stresses, Mathematical analysis.) (Lift, Drag, *Hydrodynamics.) (Hydrofoils, *Cavitation, Wings.)

A set of design charts entitled Wing Series A, for use in the preliminary design of supercavitating or fully ventilated wing systems, is presented. Curves are given relating to the performance of both single-strut and two-strut wings. Series A wings are of tapered planform with zero sweep and zero dihedral. The two strut series A wings are confined to a 2:1 taper ratio, a constant non-dimensional section modulus throughout wing and struts and by the provision that the struts be of parabolic cross section with a fully vented, blunt base. The single-strut series A wings are confined to taper ratios between 1 1/2:1 and 3 1/2:1 and may be specified to have either constant non-dimensional section modulus or constant bending stress. Their strut configuration is arbitrary. The format of the design charts is such that, given values of speed and nominal maximum bending stress, it is possible to obtain approximate optimum values of lift coefficient, bending modulus, aspect ratio and lift-drag ratio. Working examples of chart use are also included. (Author)

AD-264 995 Div. 9
(TIPSB/CCH) OTS price $2.60

Illinois U., Urbana.
STUDY OF NONLINEAR VIBRATION ISOLATION SYSTEMS. PART II - ONE DEGREE OF FREEDOM, TRANSIENT EXCITATION.
Final rept. for 6 Sep 60-31 Jan 61 on Dynamic Problems in Flight Vehicles,
by Will J. Worley and Frank H. Brittain. Apr 61, 21p. incl. illus. tables (TAM rept. no. 199)
(Contract AF 33(616)6643, Proj. 1370)
(WADD TR 60-559, pt. 2)
Unclassified report

DESCRIPTORS: (*Aerodynamics, *Vibration, Separation, *Nonlinear systems, Mathematical analysis, Functions of Time, Integration, Numerical analysis of Velocity, Acceleration, Damping and *Transients, Excitation.) (Linear systems, Analysis by Digital computers, Tables, Measurement.)

This is the final report on the study of a nonlinear vibration isolation system consisting of a single degree of freedom. This report is concerned with the transient response of the system. The data presented were obtained by means of a digital computer and the parameters in a portion of this phase of the project were assigned to be in agreement with those used in the examples in WADD TR 60-559-Part I. Part I treated the steady state behavior of the system including the synthesis of the spring and damper characteristics. Results appear in the form of tables and graphs. Values of relative displacement, velocity and acceleration of the isolated body with respect to the vibrating base as well as values of absolute displacement, velocity, and acceleration are presented. (Author)

AD-265 071 Div. 9, 25
(TIPSP/MFA) OTS price $7.60

Hiller Aircraft Corp., Palo Alto, Calif.
INVESTIGATION OF THE PROCESS OF ENERGY TRANSFER FROM AN INTERMITTENT JET TO SECONDARY FLUID IN AN EJECTOR-TYPE THRUST AUGMENTER.
Interim summary rept.,
by Raymond M. Lockwood. 31 Mar 61, 73p. incl. illus. 16 refs. (Rept. no. ARD-286)
(Contract Nonr-308200)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: (Fluid mechanics, *Fluid flow, Jet engines, *Jet propulsion, *Thrust augmenter nozzles, Ducts, *Energy.) (Instrumentation, Ultrasonics, Thermometers, Oscillators, Gas turbines, Wiring diagrams, Solar cells, Photographic equipment, Transistors, Photographs, Schlieren photography, Color photography.)

Experiments with ejector-type thrust augmenters using an intermittent jet show augmentation ratios as high as 2.4 with augmenter length-to-diameter ratio of less than 2 and jet outlet to augmenter x-section area ratio of 7. This high performance as compared with a steady flow device of similar size, is explained by higher pressure ratios obtained with an isentropic wave process. Results contributed to the practical development of a propulsion engine, the Pulse Reactor, which uses a high performance valveless pulsejet to produce the intermittent jet. A converter to produce intermittent flow from a steady flow, such as provided by a turbojet, was built and shows potential. The major effort was directed towards instrumentation and techniques for gathering data to support the energy transfer analyses. A color-modified schlieren system with a high-speed motion picture camera provides visualization of interface movement and pressure waves generated in the augmenter.

AD-265 093 Div. 9, 11
(TIPSB/MS) OTS price $10.50

Aeronutronic, Newport Beach, Calif.
STATE-OF-THE-ART SUMMARY AIR-CUSHION VEHICLES,
by William L. Rawlings and Donald H. Seiveno.
Rev. Aug 61, 140p. incl. illus. 38 refs.
(Publication no. U-926-RV-1, rev. no. 1 of Publication no. U-926; TREC Technical rept. no. 61-108)
(Contract DA 44-177-tc-724)
Unclassified report

DESCRIPTORS: (*Ground effect, Fluid mechanics, Vehicles, Theory, Jets.)

Several studies have been made of particular vehicle models in forward motion. However, these programs have not been of sufficient generality to lend themselves to inclusion in this report. Annular jet type vehicles can be made stable in pitch and roll up to heights approximating 25% of the appropriate vehicle dimension through the use of intraventing jets. No estimates of power required for such fixes are available, but current work should permit such evaluations. Vehicle control by use of differential jet control offers the possibility of providing c.p. shifts of + or - 4% of vehicle length or width. Such control is estimated to cost between 10 to 30% of vehicle lift power. The problems associated with jet impingement on the ground remain unsolved and, to a large extent, undefined. Recent propeller work has shown that blade damage caused by foreign-object ingestion can be alleviated by nickel plating. Investigations under way in the VTOL field will probably shed light on methods of reducing debris-blowing. However, further work will be required to extend VTOL investigations to include the higher planform loadings and wake velocities inherent with air-cushion vehicles. Debris deflectors appear promising but no new work has been published concerning them. (Author)

AD-265 102 Div. 9, 25
(TIPSP/TL) OTS price $4.60

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
ON THE FLOW OF INVISCID CONDUCTING FLUID PAST A CIRCULAR CYLINDER WITH APPLIED MAGNETIC FIELD,
by Ko Tamada. July 61, 47p. incl. illus.
(Contract AF 49(638)674)
(AFOSR 1087) Unclassified report

DESCRIPTORS: (*Cylindrical bodies, *Fluid flow, *Magnetic fields, Electric fields, *Magnetohydrodynamics, *Aerodynamics, Velocity, Reynolds number.) (Boundary layer, Wake.) (Partial differential equations, Differential equations, Integral equations, Equations.)

An analysis is made on the steady flow of an incompressible, inviscid, electrically conducting fluid past a circular cylinder, in the presence of an applied magnetic field parallel to the undisturbed stream. The fundamental equations are linearized by making use of the Oseen-type (or small-perturbation) approximation in order to make the problem tractable. This approximation is difficult to justify in the vicinity of the cylinder. Qualitatively correct pictures of the flow and magnetic fields may be obtained, just as in the classical Oseen theory for the ordinary viscous flow. Explicit solutions for the velocity and magnetic fields are obtained in series expansion in R sub m, the magnetic Reynolds number, correct to O x R sub m squared. More complete solutions are given for the special case in which S (pressure number) is infinite and SR sub m is finite, and for the case where S equals 1 and (S-1)R sub m equals 0 or finite. Some numerical discussions of the results are also made. (Author)

AD-265 103 Div. 9, 25
(TIPSP/TL) OTS price $11.50

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
THEORY OF VISCOUS MAGNETOGASDYNAMIC FLOW IN SLOWLY DIVERGING TWO-DIMENSIONAL CHANNELS,
by B. U. O. Sonnerup. Sep 61, 160p. incl. illus. tables.
(Contract AF 49(638)544)
(AFOSR 1332) Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, *Generators, *Electrodes, Electromagnetic fields, Magnetic fields, Electrical conductance, Reynolds number, *Fluid flow, *Gas flow, Compressible flow, Theory, Gas ionization.) (Temperature, Heat transfer, Velocity.) (Polynomials, Functions, Integral transforms, Partial differential equations, Differential equations, Integration.) Tables, Hall effect.

A class of viscous magnetogasdynamic flows at moderate Reynolds number in slightly divergent two-dimensional channels is treated theoretically. The conducting walls of the channel serve as electrodes and are connected to an external load so that the device operates as a power generator. The main component of the applied magnetic field is perpendicular to the flow direction but parallel to the channel walls. The flowing medium is a slightly ionized gas with variable fluid properties. In particular two different mathematical models of the electrical conductivity are used. The theory pertains to low values of the magnetic Reynolds number, based on the channel height, and to moderate values of the Hall parameter. Entrance and exit effects are not considered. Numerical examples pertaining to various types of boundary conditions on temperature, wall heat transfer, or potential difference across the channel are presented showing channel shapes, velocity and temperature profiles and efficiency data. (Author)

AD-265 107 Div. 9, 30
(TIPSB/MS) OTS price $1.60

General Dynamics/Convair, San Diego, Calif.
HYDRODYNAMIC TANK TESTS OF THE ONE-QUARTER-SCALE HARRAH PLANING CRAFT,
by S. T. Uyeda. Sep 61, 15p. incl. illus.
(Rept. no. ZH-156)
Unclassified report

DESCRIPTORS: (*Hydrodynamics, *Ship models, *Ship hulls, Design, Tests.) (Hydrodynamic laboratories, Model basins, Model tests.)

The results of this study indicate that the craft hull design as represented by the model is sound, and that the reasons for the adverse rolling, yawing, and pitching motions lie primarily in the powering and ruddering systems. It is felt that the remedies to obtain good performance characteristics may be found in the control of the initial unbalance of forces applied to the craft by the aforementioned systems. The adverse nose-down moment may be corrected by the use of a propeller with a higher rake and with proper pitch. A reduction of the propeller shaft angle is also recommended. It is further recommended that the rudder be located away from the propeller cavity so that the rudder area may be fully effective throughout the speed range. Spray strips, attached to the hull at the chines, may be utilized to prevent divergent bow-down attitudes, but these are not considered to be a cure for the basic problem. It is believed that these modifications will serve to measurably improve the operating characteristics of the planing craft. A certain amount of roll and yaw due to torque, however is unavoidable. (Author)

AD-265 112 Div. 9, 30
(TIPSP/WH) OTS price $4.60

General Dynamics/Convair, San Diego, Calif.
THE CONVAIR FREE JET HYPERSONIC SHOCK TUNNEL. PART I. THE STATE OF THE WORKING GAS ENTERING THE TEST SECTION. PART II. HYPERSONIC SHOCK TUNNEL JET ANALYSIS (IDEAL GAS).
by Karl A. Faymon. 2 Apr 59, 44p. incl. illus. tables (Rept. no. ZR-659-018)
Unclassified report

DESCRIPTORS: (*Shock tubes, Shock waves, Gas discharges, *Gas flow, Hypersonics, Chemical reactions, Thermodynamics, Turbulence, Fluid mechanics.) (Shock tubes, Diaphragms (Mechanics), *Hypersonic wind tunnels.) (Helium, Oxygen, Hydrogen, Gases, Shock tubes.)

The thermodynamic, electronic, and chemical state of the working gas of a shock tube as it enters the test or working section is investigated. Included are real gas effects and an evaluation of the effect of the bursting diaphragm on the gas state. The bursting diaphragm was found to have negligible effect on the state of the working gas entering the shock tube test section. The results are presented in graphical form showing the states which would exist at the test section entrance as a function of the driver-driven gas diaphragm pressure ratios when the driver gas is a mixture of Helium-Oxygen-Hydrogen. (Author)

AD-265 130 Div. 9, 15
(TIPSP/WH) OTS price $2.60

General Dynamics/Convair, San Diego, Calif.
ON SLENDER AIRFOIL THEORY FOR NON-EQUILIBRIUM FLOW,
by Inge L. Ryhming. Oct 61, 22p. incl. illus. (Rept. no. ZA-337)
Unclassified report

DESCRIPTORS: (*Aerodynamics, Gas flow, Supersonic flow, *Airfoils, Boundary layers.) (Mathematical analysis, Partial differential equations, Integral equations, Green's function.)

An exact theory for non-equilibrium flow past a thin airfoil is given. Green's function technique is used to solve the boundary value problem for the governing third order equation. Upon satisfying the boundary condition on the airfoil surface an integral equation is obtained which has an exact solution. The final expression for the velocity potential shows that the solution is dependent not only on the slope of the airfoil but also on its curvature. As an example, the supersonic flow past a wedge is considered. (Author)

AD-265 160 Div. 9, 25, 15
(TIPSP/WH) OTS price $2.60

Naples U. (Italy).
(No title).
Annual summary rept. no. 1,
by L. G. Napolitano. Mar 61, 21p. (IA rept. no. 24)
(Contract AF 61(052)327)
(AFOSR-659) Unclassified report

DESCRIPTORS: (*Gas flow, *Thermodynamics, Fluid mechanics, Dissociation, Molecules.) (Mathematical analysis, Special functions, Partial differential equations.)

A new thermodynamic approach to the study of non-equilibrium flow is presented. In section one the essential concepts of thermodynamics are briefly restated in their modern formulation which is particularly useful in the present contest. In section two, a new series of thermodynamic potentials is introduced and their properties derived and discussed. In section three these potentials are applied to the analysis of non-equilibrium flow of binary gas mixtures. It is shown that their usefulness relies upon the possibilities of: (a) obtaining rather straight-forwardly, exact solutions of particular classes of non-equilibrium flows to which all known techniques are results of classical equilibrium fluid-dynamic can be easily extended; and (b) devising a number of promising approximate methods of solutions for general non-equilibrium flow fields. (Author)

AD-265 167 Div. 9, 15
(TIPSP/MFA) OTS price $3.60

Giannini Controls Corp., Duarte, Calif.
DECAY-DAMPING RELATIONSHIPS FOR HIGHLY COUPLED SYSTEMS WITH MANY DEGREES OF FREEDOM,
by A. G. Fonda. Aug 61, 33p. incl. illus. (Rept. no. ARD TN 02-001)
(Contract AF 49(638)1015)
(AFOSR-1317) Unclassified report

DESCRIPTORS: (*Damping, Flutter, *Structures, Motion, Air speed, *Aerodynamics, Elasticity, Pistons.) (Theory, Supersonic flow, Equations, Differential equations, Functions, Numerical analysis, Polynomials.)

A mathematical study is made of the decay-damping relationships in aerodynamic theory. Basic concepts of aeroelasticity are developed with respect to air speed, flutter, and modal displacement under supersonic conditions. Limited application is made of the first-order piston theory.

AD-265 186 Div. 9, 25
(TIPSP/JW) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
CONFIGURATION FACTORS FOR EXCHANGE OF RADIANT ENERGY BETWEEN AXISYMMETRICAL SECTIONS OF CYLINDERS, CONES, AND HEMISPHERES AND THEIR BASES,

by Albert J. Buschman, Jr. and Claud M. Pittman. Oct 61, 48p. incl. illus. tables (NASA Technical note D-944)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-944.

DESCRIPTORS: (Heat transfer and *Thermal radiation from *Bodies of revolution, Cylindrical bodies, Conical bodies and Hemispherical shells.) (Design of Heat exchangers, Surface area and Configurations.) Aerodynamic configurations.

Radiation-interchange configuration factors are derived for axisymmetrical sections of cylinders, cones, and hemispheres radiating internally to annular and circular sections of their bases and to other axisymmetrical sections. The general procedure of obtaining configuration factors is outlined and the results are presented in the form of equations, tables, and figures. (Author)

AD-265 187 Div. 9
(TIPSP/JW) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
LAMINAR HEAT-TRANSFER AND PRESSURE MEASUREMENTS AT A MACH NUMBER OF 6 ON SHARP AND BLUNT 15 DEGREE HALF-ANGLE CONES AT ANGLES OF ATTACK UP TO 90 DEGREES,
by Raul J. Conti. Oct 61, 32p. incl. illus. (NASA Technical note D-962)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-962.

DESCRIPTORS: (*Fluid mechanics and Heat transfer of Rocket noses, Conical bodies for Yaw, Mach number, Turbulent flow, Laminar boundary layer and Pressure.)

Heat-transfer and pressure distributions were measured on sharp and blunt 15 degree half-angle cones. The flow was near conical on the windward side of the models up to an angle of attack of about 60 degrees. At angles of attack above 70 degrees the flow departed noticeably from conical characteristics. Heat-transfer and pressure measurements were found to agree satisfactorily with theories of simple application. At large angles of attack the effects of nose bluntness are very small in the region beyond two nose radii from the point of tangency. (Author)

AD-265 188 Div. 9
(TIPSP/JW) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF GROUND PROXIMITY ON THE AERODYNAMIC CHARACTERISTICS OF ASPECT-RATIO-1 AIRFOILS WITH AND WITHOUT END PLATES,
by Arthur W. Carter. Oct 61, 27p. incl. illus. (Technical note D-970)

Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-970.

DESCRIPTORS: (*Aerodynamics, *Ground effect and Subsonic flow, Lift, Drag, Stability, *Low drag airfoils, Sheets and Fins.) (Ground effect, Vehicles, Design.)

The effect of ground proximity on the aerodynamic characteristics of aspect-ratio-1 airfoils was investigated. The investigation was made with the model moving over the water in a towing tank. The results indicated that, as the ground was approached, lift-drag ratio was increased. The profile drag remained essentially constant for each airfoil. Near ground, the addition of end plates to the airfoil resulted in a large increase in lift-drag ratio. Lift characteristics of the airfoils indicated stability of height at positive angles of attack and instability at negative angles; therefore, the operating range of angles of attack would be limited to positive values. At positive angles of attack, static longitudinal stability was increased as height above the ground was reduced. (Author)

AD-265 193 Div. 9, 31
(TIPSP/MFA) OTS price $4.60

David Taylor Model Basin, Washington, D. C.
ON THE CALCULATION OF THRUST AND TORQUE FLUCTUATIONS OF PROPELLERS IN NONUNIFORM WAKE FLOW,
by Justin H. McCarthy. Oct 61, 41p. incl. illus. tables, 30 refs. (Rept. no. 1533)

Unclassified report

DESCRIPTORS: (*Thrust, *Torque, *Marine propellers, *Wake, *Fluid flow, Design, Vortices.) (Harmonic analysis, Propeller blades, Load distribution, Velocity, Pitch.) (Model tests, Model basins, Naval research laboratories, Ships, Experimental data.)

The general phenomenon of propeller thrust and torque fluctuations in the behind condition is discussed. Mention is made of published methods of calculating these fluctuations and of some experimentally measured values. Following, the effects of wake distribution, number of blades, propeller skew, load distribution, and stern arrangement are considered in relation to instantaneous thrust and torque absorbed by a propeller. A short method for the calculation of quasi-steady-state propeller thrust and torque fluctuations is then outlined. The method of calculation is applied to several examples and the results are compared with those given by other methods of calculation and with experimental results. Comparison indicates that the short method presented predicts thrust and torque fluctuations which are in generally good agreement with experimental results for the cases examined. (Author)

AD-265 234 Div. 9, 25, 30
(TIPSP/MFA) OTS price $1.60

Minnesota U., Minneapolis.
RESEARCH ON INTERNAL FLOW IN MAGNETOHYDRODYNAMICS AND PLASMA-DYNAMICS.
Technical rept. 22 Oct 59-31 Dec 60, on Mathematical Techniques of Aeromechanics,
by C. C. Chang, J. T. Yen and others. May 61, 13p. incl. illus.
(Contract AF 33(616)6037, Proj. 7071)
(ARL-34)

Unclassified report

DESCRIPTORS: (*Fluid flow in *Magnetohydrodynamics and *Plasma physics.) (Magnetic fields, Electrical conductance, Fluids, Ducts, Velocity, Pressure.) (Partial differential equations, Transformations (Mathematics), Integral transforms.)

A summary of a group of five related papers is presented. Each is concerned with the parallel, steady or unsteady, flow of an incompressible, viscous, electrically conducting fluid through

a duct with a steady transverse applied magnetic field. The fluid is caused to flow across the magnetic field lines by applying a pressure gradient or by moving portions of the walls. The effects of duct geometry, wall conductivity and unsteadiness is investigated. (Author)

AD-265 237 Div. 9, 2
(TIPSP/WH) OTS price $5.60

North American Aviation, Inc., Downey, Calif.
BOUNDARY LAYER TRANSITION AT SUPERSONIC SPEEDS-THREE DIMENSIONAL ROUGHNESS EFFECTS (SPHERES),
by E. R. van Driest and C. B. Blumer.
15 Aug 61, 54p. incl. illus. (Rept. no. SID 61-275)
(Contract AF 49(638)250)
(AFOSR-1493) Unclassified report

DESCRIPTORS: (Fluid mechanics, *Aerodynamics, *Supersonics, Boundary layer, Turbulence, Drag, Heat transfer, Radar echo areas.) (*Guided missile noses, Re-entry vehicles, Conical bodies, Blunt bodies, Surfaces.) Supersonic wind tunnels.

Experiments carried out in the 12-inch supersonic wind tunnel to investigate the effect of three-dimensional roughness elements (spheres) on boundary-layer transition on a 10-degree (apex angle) cone without heat transfer are described. The local Mach number for these tests was 2.71. The data show clearly that the minimum (effective) size of trip required to bring transition to its lowest Reynolds number varies as the one-fourth power of the distance from the apex of the cone to the trip. Use of available data at other Mach numbers indicates that the Mach number influence for effective tripping is taken into account by a simple expression. Some remarks concerning the roughness variation for transition on a blunt body are made. Finally, a general criterion is introduced which gives insight to the transition phenomenon and anticipates effects of external and internal disturbances, Mach number, and heat transfer. (Author)

AD-265 242 Div. 9
(TIPSP/WH) OTS price $1.25

National Aeronautics and Space Administration, Washington, D. C.
COMPARISON OF EXPERIMENTAL AND THEORETICAL STATIC AEROELASTIC LOADS AND DEFLECTIONS OF A THIN 45 DEGREE DELTA WING IN SUPERSONIC FLOW,
by Floyd V. Bennett. Oct 61, 41p. incl. illus. tables (Technical note no. D-974)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-974.

DESCRIPTORS: (Aircraft, Airframes, *Aerodynamics, *Load distribution, *Stresses, Deflection, Deformation, *Triangular wings.) (Experimental data, Theory.) Wind tunnels, Supersonic flow.

Wind-tunnel data showing the effects of static aeroelasticity are presented and compared with theory in the Mach number range 1.30 to 4.00. Calculated deformation, normal-force coefficients, and pitching-moment coefficients based on linearized potential theory are shown to compare favorably with the wind-tunnel results. Calculations are also made at Mach numbers of 3.00 and 4.00 based on piston theory and on a modification of piston theory. (Author)

AD-265 243 Div. 9, 1
(TIPSA/WAW) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
AN INVESTIGATION OF THE EFFECT OF DOWNWASH FROM A VTOL AIRCRAFT AND A HELICOPTER IN THE GROUND ENVIRONMENT.
by Thomas C. O'Bryan. Oct 61, 19p. incl. illus. (NASA Technical note no. D-977)
Unclassified report

Also available from NASA. Wash. 25, D. C.. as NASA Technical note D-977.

DESCRIPTORS: (*Helicopters, *Vertical take-off planes, *Convertible airplanes, Ground effect.) (*Helicopter rotors, *Aerial propellers, Wake.) (Downwash, Wake, Pressure, Measurement.) Aerodynamics.

Dynamic-pressure measurement, in ground effect, have been obtained about a single-rotor helicopter and a dual-propeller VTOL aircraft. The results indicate that the slipstream dynamic pressure along the ground, some distance from the center of rotation, is not a function of disk loading but merely a function of the gross weight or thrust of the aircraft. Furthermore, for a given gross weight the thickness of this outward flowing sheet of air is less for a small-diameter propeller (higher disk loading propeller). The variation of the dynamic-pressure flow field for single and dual propellers or rotors is significantly different in the plane of symmetry between the two rotors than in a direction normal to this plane. The interaction of the two flows produces a region of upflow in this plane where the fuselage is located, and the decay of the maximum dynamic pressure with distance ahead of the fuselage is slower. (Author)

AD-265 253 Div. 9
(TIPSP/JDP) OTS price $2.25

National Aeronautics and Space Administration, Washington, D. C.
TRANSONIC AERODYNAMIC LOADING CHARACTERISTICS OF A WING-BODY-TAIL COMBINATION HAVING A 52.5 DEGREE SWEPTBACK WING OF ASPECT RATIO 3 WITH CONICAL WING CAMBER AND BODY INDENTATION FOR A DESIGN MACH NUMBER OF THE SQUARE ROOT OF 2,
by Marlowe D. Cassetti, Richard J. Re, and William B. Igoe. Oct 61, 99p. incl. illus. tables (Technical note no. D-971)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-971.

DESCRIPTORS: (*Aerodynamic configurations, *Transonics, *Load distribution, Wind tunnel models.) (Wing-body configurations, Swept-back wings, Conical wings, Transonic wind tunnels, Stability (Longitudinal).)

An investigation has been made of the effects of conical wing camber and body indentation according to the supersonic area rule on the aerodynamic wing loading characteristics of a wing-body-tail configuration at transonic speeds. The wing aspect ratio was 3, taper ratio was 0.1, and quarter-chord-line sweepback was 52.5 deg with 3-percent-thick airfoil sections. The tests were conducted in the Langley 16-foot transonic tunnel at Mach numbers from 0.80 to 1.05 and at angles of attack from 0 to 14 deg, with Reynolds numbers based on mean aerodynamic chord varying from 7 x 10 to the 6th power to 8 x 10 to the 6th power. Conical camber delayed wing-tip stall and reduced the severity of the

accompanying longitudinal instability but did not appreciably affect the spanwise load distribution at angles of attack below tip stall. Body indentation reduced the transonic chordwise center-of-pressure travel from about 8 percent to 5 percent of the mean aerodynamic chord. (Author)

AD-265 267 Div. 9, 25
(TIPSP/MFA) OTS price $1.60

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
METHOD FOR CALCULATING SUPERSONIC FLOW IN A JET CONTAINING SHOCKS,
by Mildred Moe. 7 March 57, 18p. incl. illus.
(Rept., no. GM-TM-152; GM42-178)
Unclassified report

DESCRIPTORS: (Gas flow, *Supersonic flow, Supersonic nozzles, *Jets, *Shock, Compression shock.) (Thermodynamics, Entropy, Pressure, Specific heat, Density, Velocity, Mach number.) (Equations, Differential equations, Difference equations, Series.)

The method used to calculate the density, pressure and temperature distribution in a gas flowing out of a nozzle at supersonic speed is described. The nozzle is situated in a uniform supersonic stream moving parallel to the nozzle's axis of symmetry. The conditions at the exit plane of the nozzle and in the uniform external stream are prescribed. (Author)

AD-265 272 Div. 9
(TIPSA/WAW) OTS price $14.00

Polytechnic Inst. of Brooklyn, N. Y.
HELIUM INJECTION INTO THE BOUNDARY LAYER AT AN AXISYMMETRIC STAGNATION POINT.
Interim rept. on Research on Aerodynamic Flow Fields,
by Herbert Fox and Paul A. Libby. Sep 61, 207p. incl. illus. tables, 25 refs.
(Contract AF 33(616)7661, Proj. 7064)
(ARL-139) Unclassified report

DESCRIPTORS: (*Blunt bodies, Hypersonic flow, Compressible flow, Boundary layer control, *Laminar boundary layer, Boundary layer, Cooling, Heat transfer, Mathematical analysis.) (Sweat cooling, Helium.) (Aerodynamic heating, Reduction.) Differential equations, Integral equations.

A theoretical analysis of the boundary layer at an axisymmetric stagnation point with large rates of helium injection is presented. The exact stagnation point boundary layer equations are integrated numerically with an approximate representation of the gas properties. The new treatment of the two-point boundary value problem that arises is shown to be useful for various boundary layer and mixing problems. The exact solutions indicate that for large rates of injection the boundary layer can be represented by a thick, inner layer of constant shear, temperature and composition and by a relatively thin outer region in which the flow variables adjust to their free-stream values. An inviscid flow model is shown to lead to accurate predictions of this shear layer and will thus provide sufficiently accurate profiles for use in the study of the downstream influence of stagnation point mass transfer. The heat transfer to the stagnation point is also considered. Tabulations of the solutions for a variety of wall conditions and injection rates are given in an appendix. (Author)

AD-265 324 Div. 9, 12
(TIPSB/CCH) OTS price $2.60

Westinghouse Electric Corp., Baltimore, Md.
ORBITS WITH LOW TANGENTIAL THRUST,
by George Shapiro. 5 Sep 61, 21p. incl. illus.
(Contract AF 49(638)1002, Proj. 9783)
(AFOSR-1479) Unclassified report

DESCRIPTORS: (*Thrust of Orbital flight paths, Analysis, Experimental data, Mathematical analysis.) Test methods.

The method of Krylov-Bogoliuboff is used to analyze orbits with an additional low tangential thrust. It is shown that, initially, circular orbits remain circular to the first approximation while elliptical orbits become less elliptic (thrust in the direction of motion). A complete set of curves relating significant orbit parameters is also presented. (Author)

AD-265 351 Div. 9
(TIPSP/MFA) OTS price $1.60

Space Technology Labs., Inc., Los Angeles, Calif.
EQUILIBRIUM HYDRODYNAMIC VARIABLES BEHIND A NORMAL SHOCK WAVE IN HYDROGEN,
by Eugene B. Turner. 26 Aug 58, 14p. incl. illus.
(Rept. no. GM-TR-0165-00460)
(Contract AF 04(647)165)
Unclassified report

DESCRIPTORS: (*Hydrodynamics behind *Shock waves in *Hydrogen.) (Gas ionization, Mach number, Pressure, Density, Temperature, Velocity, Enthalpy, Energy.) (Equations, Quantum mechanics, Theory, Experimental data.)

A complete calculation of the hydrodynamic variables for shock Mach numbers up to and beyond the point where hydrogen becomes completely ionized is prescribed. A set of curves for initial pressures of 0.001 and 0.01 At. was calculated in February 1957. Recent experimental work at lower pressures has made it necessary to revise the original calculations with the addition of a set of curves for 0.0001 At. initial pressure. The curves include density ratio across the shock wave, the temperature behind the shock wave and the degree of ionization. The first graph runs from a shock Mach number of 1 to 70 while the second graph continues from a shock Mach number of 60 to 200, a region where the hydrogen may be considered completely ionized. (Author)

AD-265 379 Div. 9
(TIPSP/JDP) OTS price $4.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
AERODYNAMICS OF DEFLECTED SLIPSTREAMS. PART I. FORMULATION OF THE INTEGRAL EQUATIONS,
by A. Sowyrda. Oct 61, 45p. incl. illus. 21 refs.
(Rept. no. Al-1190-A-6)
(Contract DA 44-177-tc-439, Proj. 9-38-01-000, ST902)
(TREC TR 61-32) Unclassified report

DESCRIPTORS: (*Aerodynamics, Deflection, *Turbulent flow, Mathematical analysis, Integral equations.) (Short take-off planes, Vertical take-off planes.) (Wings, Lift, Vortices, Jets, Boundary layer, Vector analysis.)

The effects of jet curvature are investigated on the premise that at higher angles of flow deflection, this factor should have an important influence on wing lift. The jet boundary is

regarded as a vortical layer, as is also the wing surface and its wake. The jet vorticity distribution is determined subject to the dynamic equations of rotational flow which are applied in a thin region at the jet boundary. This approach leads to the consideration of jet trailing vorticity or secondary vorticity which occurs in certain curved nonuniform flows. (Author)

AD-265 409 Div. 9, 12
(TIPSP/WH) OTS price $9.10

Lockheed Aircraft Corp., Sunnyvale, Calif.
FREE MOLECULE FLOW THEORY AND ITS APPLICATION TO THE DETERMINATION OF AERODYNAMIC FORCES,
by Lee H. Sentman. 1 Oct 61, 109p. incl. illus. (Rept. no. LMSC-448514)
Unclassified report

DESCRIPTORS: (*Superaerodynamics, Aerodynamics, Gases, Gas flow, Molecules, Kinetic theory.) (*Satellite vehicle trajectories, Drag, Satellite vehicles, Satellite attitude.)

The purpose of this analysis is twofold. It is designed as an introduction to free molecule flow theory for those with no background in rarefied gas dynamics or kinetic theory, and it presents an exact method for the determination of the forces and moments on bodies in a free molecule flow. Approximate methods are evaluated. Comparison with the exact method of this analysis shows that for molecular speed ratios at satellite altitudes the approximate theories, which do not completely account for the random motion of the impinging molecules, are satisfactory for the prediction of CN and CM. For elongated bodies at small angles of attack, the approximate methods are shown to be inadequate for the prediction of CA. Tables of certain functions requisite to the determination of free molecule aerodynamic coefficients are presented. (Author)

AD-265 465 Div. 9, 31
(TIPSE/WAW) OTS price $12.50

Hughes Aircraft Co., Culver City, Calif.
LONGITUDINAL STABILITY AND CONTROL OF CANARD HYDROFOIL CRAFT,
by Gilbert Chuck and Richard K. C. Luke. June 61, 171p. incl. illus. tables (Rept. no. SRS-440)
(Contract NObs-78572)
Unclassified report

DESCRIPTORS: (*Hydrofoil boats, Canard configuration, *Stability, Stability (Longitudinal), Control, Mathematical analysis, Design, *Hydrodynamics.) (Stabilization, Water waves.)

A study of longitudinal stability and control of canard hydrofoil-supported craft of the 110-long-ton weight class, in both calm and disturbed seas, is presented. Configurations involve craft with all foils fully submerged, all foils surface-piercing, and foils of hybrid arrangement (submerged forward, surface-piercing aft and vice versa). As a design aid, effects of variations of major parameters such as speed, c.g. location, foil spacing, dihedral angle, etc. are illustrated. It is shown that autopilot stabilization of the submerged-foil reference craft is required in waves. Although the surface-piercing-foil reference craft is inherently stable in both smooth water and disturbed seas, its capabilities in waves are more limited than those for the submerged-foil vehicle. Also presented is a comparison of canard and conventional configurations in calm and disturbed seas. (Author)

AD-265 480 Div. 9
(TIPSP/GW) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
CHARTS DEPICTING KINEMATIC AND HEATING PARAMETERS FOR A BALLISTIC REENTRY AT SPEEDS OF 26,000 TO 45,000 FEET PER SECOND,
by Uriel M. Lovelace. Oct 61, 52p. incl. illus. (NASA Technical note no. D-968)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-968.

DESCRIPTORS: (*Hypersonics, *Re-entry vehicles, Re-entry aerodynamics, *Aerodynamic heating, Heat transfer.) (Atmosphere entry, Azimuth, Velocity, Terminal ballistics, Range, Nomographs.) (Programming, Digital computers.)

Re-entry trajectories, including computations of convective and radiative stagnation-point heat transfer, were calculated by using equations for a point-mass reentry vehicle entering the atmosphere of a rotating, oblate earth. Velocity was varied from 26,000 to 45,000 fps; reentry angle, from the skip limit to -20 degrees; ballistic drag parameter, from 50 to 200. Initial altitude was 400,000 ft. Explicit results are presented in charts which were computed for an initial latitude of 38 degrees N and an azimuth of 90 degrees from north. A method is presented whereby these results may be made valid for a range of initial latitude and azimuth angles. (Author)

10. FUELS AND COMBUSTION

AD-264 749 Div. 10, 30
(TIPSM/REB) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
THE PREDICTION OF THERMAL HAZARDS IN PROPELLANTS BY A NOMOGRAPHICAL TECHNIQUE,
by Peter L. Stang and Colin A. Taylor. 9 Oct 61, 24p. incl. illus. tables (NOTS Technical publication 2755)
(NAVWEPS Report 7774) Unclassified report

DESCRIPTORS: (Mathematical prediction, Nomographs, *Hazards, Temperature, Explosions, Propellants, *Solid rocket propellants.) (Thermal conductivity, Heat transfer, Chemical reactions, Ignition, Decomposition, Reaction kinetics.) (Cylindrical bodies, Surface temperatures.) Test methods, Sensitivity.

A nomographic technique developed for predicting thermal hazards in explosives was applied to double-base and cast composite propellants. Chemical and physical property data, together with differential thermal analysis or an adiabatic auto-ignition determination on the material under investigation, are required in order to solve the nomographs. Predicted time to deflagration for representative propellants was compared with experimental data obtained in cook-off tests. The need for improved chemical and physical property data, extension of the nomographs to account for changes occurring with time and temperature and more cook-off data on larger masses of propellant was indicated. (Author)

AD-264 788 Div. 10
(TIPSM/SEB) OTS price $1.60

Rocketdyne, Canoga Park, Calif.
RESEARCH IN HYBRID COMBUSTION.
Quarterly rept. for period ending 31 Aug 61, by M. V. Peck and R. M. Lodwig. 30 Sep 61, 23p. incl. illus. (Rept. no. R-2267-5)
(Contract Nonr 3016000)
Unclassified report

DESCRIPTORS: (*Hybrid rocket propellants, Combustion, Theory, Mathematical analysis.) (Rocket fuels of Oxygen and Aluminum in Acrylic resins, Methyl radicals, Polymers.) (*Combustion chamber gases, Mass spectroscopy.) (Deposits, X-ray diffraction analysis.) Test equipment.

The combustion processes of a 30-% aluminum in polymethylmethacrylate fuel and gaseous O were investigated at two O flows. Mass burning rates have been determined and are compared with the regression rates of the pure plexiglass fuel. (Author)

AD-264 854 Div. 10, 30, 25
(TIPSM/REB) OTS price $1.10

Aerospace Corp., El Segundo, Calif.
PROPELLANT PERFORMANCE CALCULATION PROGRAM,
Semiannual technical rept., 1 Jan-30 June 61, by P. C. Hanzel. 30 June 61, 3p. (Rept. no. TDR-594(1254-01)TR-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Rocket propellants, Tests, Determination of Specific impulse.) (Digital computers, Programming, Determination, Thermodynamics, Chlorine, Aluminum, Hydrogen, Helium, Lithium, Beryllium, Boron, Carbon, Oxygen, Nitrogen, Fluorine, Magnesium.) Pressure, Chemical equilibrium, Gases, Liquids, Solids.

The calculation of rocket propellant performance includes procedures involving the simultaneous solution of many nonlinear equations and inequalities. These relations may be reduced to a few standard forms amenable to digital computation. The versatility and generality demanded by an accelerated rocket propellant technology require the minimum number of restrictions on the capability of the machine computational program. Computation of composition, which depends upon the initial guess of the pressure of monatomic gases, is proving to be successful with respect to obtaining convergence. (Author)

AD-265 233 Div. 10, 4
(TIPSM/EET) OTS price $7.60

Midwest Research Inst., Kansas City, Mo.
EFFECTS OF ANTI-ICING ADDITIVES ON JET FUEL PROPERTIES.
Rept. for 1 Sep 60-31 Apr 61, by Daniel A. Netzel, Thomas J. Byerley, and Harry B. Pollock. May 61, 72p. incl. illus.
(Contract AF 33(616)7598, Proj. 3048)
(ASD TR 61-280) Unclassified report

DESCRIPTORS: (*Ice prevention in *Jet engine fuels by Fuel additives, Effectiveness.) (De-icing materials, Wetting agents, Corrosion, Chemical properties, Physical properties, Storage, Stability.) (Fuel storage tanks, Coatings, Fuel additives, Contamination, Microorganisms, Growth.)

The storage stability of jet fuels containing anti-icing additive P55MB was investigated during a storage period of 5 months. Tests included (1) thermal stability, (2) gum content, (3) API gravity, (4) aniline point, and (5) sulfide content. The effect of the additive on the extent of removal of corrosion products by flaking was investigated. Also investigated was the effect of the additive in promoting or limiting the growth of microorganisms found in the natural water bottoms of fuel storage tanks. The physical stability of solutions of additive P55MB in jet fuel was studied as well as the water-retention characteristics of P55MB in jet fuel. The effects of anti-icing additives P55MB and Additive A on the hardness of the topcoating of the fuel tanks were studied in detail. A graphical relationship is given between the laboratory method and the field method (Sward Rocker Hardness Test and Pencil Hardness Test, respectively) of determining the hardness of the fuel-tank topcoating. (Author)

AD-265 273 Div. 10, 4
(TIPSM/EET) OTS price $1.60

Phillips Petroleum Co., Bartlesville, Okla.
GAS TURBINE AND JET ENGINE FUELS.
Bimonthly progress rept. no. 3, by W. L. Streets. 17 July 61, 11p. incl. illus. table (Research Division rept. no. 2959-61R)
(Contract NOw 61-0590-d)
Unclassified report

DESCRIPTORS: (*Jet engine fuels, Sulfur compounds, Alkyl radicals, Butyl radicals, Sulfides, Corrosion of Combustion chambers with Gulf of Mexico, Sea water, Spectrographic analysis, Test methods, Tests.) (Gas turbines, Inlet guide vanes, Stainless steel, Steel tubing, Jet engine fuels, Sulfur compounds, Gulf of Mexico, Sea water, Contamination by Copper, Nickel, Test methods, Tests.)

The effects sulfur in jet fuels and ingested sea water on the durability of jet engine hot section components were studied. Attempts were made to determine the reason for higher flame tube corrosion rates observed during operation with ingested natural Gulf sea water as compared to synthetic sea water. Efforts were also initiated toward the development of a suitable test method for the evaluation of the effect of fuel S and sea water on simulated turbine inlet guide vane durability. Preliminary experiments were made with cart-wheel shaped simulated guide vanes during operation with a nearly S-free fuel and with this same fuel contaminated with 1% sulfur. (Author)

AD-265 282 Div. 10, 12, 9
(TIPSP/WH) OTS price $1.10

Thompson Ramo Wooldridge, Inc., Los Angeles, Calif.
DESIRABLE EXPERIMENTS ON SLOSH DAMPING,
by G. J. Gleghorn. 2 July 57, 4p. (Rept. no. GM45.3-327)
Unclassified report

DESCRIPTORS: (*Liquid rocket propellants, Fuel tanks, *Damping, Fluid mechanics, Analysis, Mathematical analysis.

Approaches to the problem of slosh damping are examined. In general, the most promising line of attack is to measure accurately the ratio of actual to predicted logarithmic decrements (or their equivalents), under carfully controlled laboratory conditions. The hope is that ob-

served values of this variable constant will vary gradually and according to recognizable trends. The following aspects of the problem are considered: spaced baffles, scale effect, amplitude effects, roughness effects, and hydroelastic effects. (Author)

AD-265 361 Div. 10, 27
(TIPSM/EJH) OTS price $5.00

Directorate of Advanced Systems Technology, Wright-Patterson Air Force Base, Ohio.
THE SPECIFIC IMPULSE OF HYDROGEN BURNED IN NITROGEN-OXYGEN MIXTURES.
Rept. for Aug 59-Aug 60 on Aviation Fuels.
by James H. L. Lawler. Nov 60, 315p. incl. illus. tables.
(WADD TN 60-254) Unclassified report

DESCRIPTORS: (*Rocket propulsion, Gases, *Hydrogen, *Specific impulse, Combustion in Mixtures, Oxygen and Nitrogen.) (Combustion chambers, Exhaust gases, High pressure research, Pressure.) (Rocket propellants, Gaseous rocket propellants, Gas diffusion.) Thermochemistry, Thermodynamics, Mathematical analysis, Tables.

Specific impulse curves are presented for O-N mixtures of 90, 85, 80, 75, 70, and 60% by weight O being burned with H. The chamber pressures were 1000 psia and 500 psia and various exhaust pressures from 7.35 psia to 0.005 psia were used. Expansion ratio vs impulses for the several conditions is plotted. The specific impulse is a function of expansion ratio and is independent of the chamber pressure in the range of 500 to 1000 psia chamber pressure. It is desirable to burn a H rich mixture as the specific impulse is highest with slightly more H than storchiometric. This is theorized to be due to the average molecular weight being lowered faster than the temperature drop. (Author)

AD-265 395 Div. 10, 25
(TIPSP/WH) OTS price $1.60

Laboratories for Applied Sciences, U. of Chicago, Ill.
RADIATION FROM SYSTEMS OF MOLECULAR AND PARTICULATE EMITTERS, ABSORBERS AND SCATTERERS,
by Charlotte E. Bartky. Oct 61, 7p. incl. illus.
(Rept. no. LAS-TN-199-24)
(Contract SD-71)
Unclassified report

DESCRIPTORS: (Molecules, Particles, Absorption, *Blackbody radiation, Scattering.) (*Exhaust flames, *Exhaust gases, Flames, Hydrocarbons, Oxygen, Thermodynamics.)

The combustion products of a flame or rocket engine consist, in general, of a gas or of several gases, or of a mixture of particles such as carbon or oxides, and gases. In order to calculate the radiation from these systems, an expression is needed which takes into account the emissive properties of the gases and particles, and scattering by the particles if important in the wavelength region concerned, and the temperature, pressure and concentration variations of the system. An added benefit of a general relation is a better understanding of the physical processes. The radiation balance equation is obtained for a system of gases and particles in local thermodynamic equilibrium. (Author)

AD-265 497 Div. 10, 4, 25
(TIPSM/SEB) OTS price $4.60

Rocket Power, Inc., Pasadena, Calif.
STUDY OF ROCKET ENGINE EXHAUST PRODUCTS.
Quarterly rept. no. 1, 1 June-31 Aug 61.
31 Aug 61, 1v. incl. illus. tables (Rept. no. QR-7414-1)
(Contract AF 04(611)7414)
Unclassified report

DESCRIPTORS: (*Rocket motors, Rocket propellants, Combustion, Exhaust flames, *Exhaust gases, Chemicals, Physical properties, Thermodynamics, Theory.) (*Beryllium compounds, *Oxides, *Fluorides, Heat of formation, Entropy, Evaporation, Vaporization, Heat of fusion, Tests.) (High temperature research, Test methods, Test equipment.)

A research program was undertaken to determine the physical and thermodynamic properties of BeF2 (s,l,g), BeO(s,g), and BeF(g) formed by the combustion of propellants. A special facility for the handling of Be compounds has been constructed and is being employed for the determinations. By employing the Knudsen effusion technique and operating in the temperature range 550-780 C the heat of evaporation (53.25 kcal), entropy of evaporation (38.7 e.u.), and entropy at 1000 k (27.7 e.u.) were determined for BeF2. The melting point of BeF2 has been definitely established to be 543 + or -3 C. (Author)

11. GROUND TRANSPORTATION EQUIPMENT

No Entries

12. GUIDED MISSILES

AD-264 753 Div. 12
(TIPSA/NTM) OTS price $3.60

Naval Research Lab., Washington, D. C.
ANALYSIS OF THE THERMOSTRUCTURAL REQUIREMENTS FOR THE ATMOSPHERIC RE-ENTRY OF SATELLITES AND SPACE VEHICLES,
by W. S. Pellini. 15 Aug 61, 33p. incl. illus. tables (NRL Rept. 5655)
Unclassified report

DESCRIPTORS: (Re-entry aerodynamics, Satellite vehicles, *Re-entry vehicles, Spaceships, *Atmosphere entry, Hypervelocity vehicles, Satellite vehicles trajectories, Airframes, Thermal insulation, Lift, Drag, Deceleration, Orbital flight paths, Velocity, Manned.) (Aerodynamic heating, Heat transfer, Thermal radiation, Impact shock.) (Materials, Metals, Ceramic materials, *Thermal insulation.)

The thermostructural requirements of re-entry vehicles are determined by the kinetic energy of the vehicle on penetration of the atmosphere and by the program of the dissipation of this energy by conversion to heat, which is generated by the aerodynamic braking effects of the atmosphere. The vehicle velocity and entry angle may be classed as approach variables and the aerodynamic characteristics of the body as vehicle variables. These variables are discussed, with particular emphasis on the wide range of energy conversion programs which are made available by choice of the vehicle design. The possible types of re-entry vehicles are analyzed by a description of the aerodynamic characteristics of the various principal types. The aerodynamic features of re-entry vehicles may be classified into the two broad subdivisions of lift and drag flight. Lift flight vehicles are represented primarily by the glide aircraft and lifting capsule families, and drag flight vehicles by drag capsules, satellite bodies, and nose cones. The primary distinction is between bodies that rely on aerodynamic lift, with the associated drag for gradual deceleration from orbital to subsonic velocity, and bodies that undergo a shocklike deceleration to terminal fall velocity. (Author)

AD-264 755 Div. 12
(TIPSE/NTM) OTS price $2.60

National Bureau of Standards, Washington, D. C.
INTERMEDIARY EQUATORIAL ORBITS OF AN ARTIFICIAL SATELLITE,
by John P. Vinti. 2 Oct 61, 19p. (NBS Rept. 7345)
(Sponsored by the Air Force Office of Scientific Research)
(AFOSR 1480) Unclassified report

DESCRIPTORS: (*Satellite vehicles, *Satellite vehicle trajectories, *Orbital flight paths.) (Polynomials, Series, Integrals, Mathematical analysis.)

A previous paper derived the solution for the drag-free motion of an artificial satellite in the gravitational field of an oblate planet. The corresponding potential, expressed in oblate spheroidal coordinates, leads to separability and represents the even zonal harmonics exactly through the second, for any oblate planet, and approximately through the fourth, in the case of the earth. The previous paper contained a restriction on the orbital inclination I, viz., I sub c less than I less than 180 degrees - I sub c, where I sub c might be as large as 1 degree 54 minutes for an orbit sufficiently close to the earth. The present paper removes this restriction and shows that many of the formulae for the periodic terms may be simplified, when the orbit is equatorial or almost so. The results agree with those obtained by a direct two-dimensional solution, when the orbit is purely equatorial. (Author)

AD-264 759 Div. 12, 14, 26
(TIPSM/TCG) OTS price $.50

Naval Research Lab., Washington, D. C.
THE FIBERGLASS MOTOR CASE IN THE POLARIS PROGRAM,
by H. Bernstein and J. A. Kies. 19 Sep 61, 20p. incl. illus. table (NRL Rept. no. 5650)
(In cooperation with Bureau of Naval Weapons)
Unclassified report

DESCRIPTORS: (*Guided missiles, Solid rocket propellants, *Rocket motors, *Rocket cases for Materials.) (*Plastics, Steel, Titanium alloys, Mechanical properties, Tensile properties, Tests.) (Reinforcing materials, *Glass textiles for Plastics in Filament wound construction, Production, Processing, Handling, Storage, Costs, Manufacturing methods.) (*Plastics, Tests, Theory, Mathematical analysis.) (*Resins, Resin adhesives, Bonding, Crazing, Stresses, Tensile properties, Mechanical properties, Photoelasticity.)

A comparison between the apparent practical limits of the usable tensile strength-density ratio for steels, Ti alloys, and glass-fiber-reinforced plastic rocket-motor cases showed that the plastic motor case offers considerable advantages in weight and cost. Filament winding of fiberglass-reinforced motor cases produced greater simplicity and flexibility of tooling and fabrication techniques and shorter lead time than metal working. Theoretical and practical limitations on the strength of glass-reinforced materials in terms of flaws or defects are usually the result of fabrication, processing, handling, and storage. Methods for controlling these flaws are being evaluated. Failure of glass-reinforced plastic structures was partly caused by crazing and cracking of the resin binder. Shrinkage stresses in the resin were an important contributor to this process. A substantial increase in the performance of fiberglass motor cases in the near future appears possible if a study of defects and shrinkage stresses is included. (Author)

AD-264 856 Div. 12, 6
(TIPSW/RD) OTS price $1.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
ACCURACY OF MISSILE SOUND RANGING,
by Marvin Diamond and Allan B. Gray. Oct 61, 14p. incl. illus. table (Technical rept. no. 110)
Unclassified report

DESCRIPTORS: (*Sound ranging, Sound, Propagation, *Shock waves, Rocket motor noise, Detection, Acoustic detectors, Microphones.) (*Guided missiles, Guided missile trajectories, Terminal ballistics, Determination, Mathematical prediction, Recovery.) (Errors, Azimuth, Analysis.)

A technique for determining the impact point of missiles by the detection of the shock wave generated during a missile's descent was developed. This technique, including the instrumentation and computations involved and an error analysis, is presented. (Author)

AD-264 863 Div. 12
(TIPSP/WH) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
APPROXIMATING THE IMMEDIATE PATH OF A SATELLITE,
by George E. Reynolds and Otho E. Kerr, Jr. June 61, 15p. incl. illus.
(Proj. 4600)
(AFCRL-377) Unclassified report

DESCRIPTORS: (*Satellite vehicles, Tracking, Position finding, Direction finding.) (Satellite vehicle trajectories, Radio transmitters, Doppler systems, *Orbital flight paths.)

Three simplified methods are presented for approximating the position, elevation, velocity, and direction of a transmitting satellite from data obtained from a small network of ground stations. The necessary assumptions (stationary system on a planar earth and horizontal flight at constant velocity) prohibit the possibility of determining the complete orbit but do narrow the field search for instruments of greater precision. (Author)

AD-264 949 Div. 12, 30
(TIPSP/WH) OTS price $1.60

Naval Research Lab., Washington, D. C.
SATELLITE COORDINATES AND REAL-TIME POSITION COMPUTATION,
by W. D. Dahl. 12 Sep 61, 11p. incl. illus. tables (NRL rept. no. 5659)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, Position finding, *Orbital flight paths, Computers, Digital computers.) (Mathematical analysis, *Celestial mechanics, Motion, Equations, Differential equations.)

The size and shape of a satellite orbit and its orientation with respect to the earth are defined by these six modified orbital elements: (Semimajor axis of the elipse), (eccentricity of the ellipse), (inclination of the orbital plane to the earth's equatorial plane), (argument of perigee), (longitude of the ascending node), and (reference time). Equations are given for the computation of the geocentric spherical coordinates of satellite positions. These equations were programmed for computation by the Naval Research Laboratory Electronic Digital Computer (Narec) and positions for the satellite 1958 Beta 2 (Vanguard I) were computed. The resulting positions, using the modified orbital elements, were compared with positions computed by the IBM Space Computing Center for the same satellite and the same time interval. The maximum differences for each coordinate computed were: longitude, 0.071 degrees, latitude, 0.197 degrees, and height, 3.85 statute miles. Several timing runs were performed where no printout of positions was obtained, but answers were, instead, stored in the Narec memory. From these runs, the speed which position coordinates are computed by the Narec was estimated to be 5.40 position solutions per second for the minimum usable tolerance of the computer, and 7.69 position solutions per second for the largest tolerance value compatible with three decimal accuracy in the answers. (Author)

AD-264 958 Div. 12, 2
(TIPSP/GRW) OTS price $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
DETERMINATION OF A UNIQUE ATTITUDE FOR AN EARTH SATELLITE,
by William R. Davis. rev. 15 Nov 57, 23p. incl. illus. (Rept. no. LMSD-2132A)
Unclassified report

DESCRIPTORS: (Satellite vehicles, *Satellite attitude, Determination.) (*Orbital flight paths, Yaw, Roll, Centrifugal fields, Moments, Mathematical analysis.) Gravity.

The existence of unique stable attitudes for a body orbiting in a central gravitational force field such as that of the earth is shown to depend only upon the requirement that the three principal moments of inertia of the body be different, upon the diverging nature of the gravitation field, and upon the centrifugal force effects of the orbital angular velocity. Both mathematical and physical models (Sputnik II) are discussed. Particular emphasis is given to the existence of unique attitude about a body axis which is maintained always colinear with the radius vector from the center of the gravitational field to the center of mass of the body. (Author)

AD-265 000 Div. 12, 30
(TIPSW/CDM) OTS price $1.60

Naval Ordnance Lab., Corona, Calif.
MONITORING THE MECHANICAL OPERATION OF FUZE SAFETY-ARMING MECHANISMS,
by L. V. Craycraft and E. E. Barilotti.
1 Nov 61, 14p. incl. illus. (NOLC rept. no. 556)
Unclassified report

DESCRIPTORS: (*Guided missile fuzes, Safety devices, Arming devices.) (*Test equipment, Time interval counters, Accelerometers, Electronic equipment, Monitors.) (Test methods, Centrifuges, Tests.)

A monitoring system is described that detects and records the mechanical operations taking place inside a safety-arming device (S-A) while it is being tested within a rotary accelerator. A ruggedized miniature crystal accelerometer, fastened to the case of the S-A, responds to internal vibrations caused by pallet clatter on the gear train, solenoid plunger bottoming, and g-weight movement. The resulting signals are converted to electrical energy and fed to an amplifier, also on the centrifuge arm, from which they are conducted through slip rings to a recorder. In addition, records are made of the time of S-A switch operations as well as the time of voltage application to the launch-latch solenoid. (Author)

AD-265 047 Div. 12, 6
(TIPSA/RD) OTS price $5.60

Aeronutronic, Newport Beach, Calif.
BLUE SCOUT RECOVERY VEHICLE AMR DROP TESTS.
Final test rept. on TS 609A.
24 Feb 61, 55p. incl. illus. tables (Publication no. U-1164)
(Contract AF 04(647)449)
Unclassified report

DESCRIPTORS: (*Space capsules, *Space probes, *Re-entry vehicles, *Recovery, Position finding, Tests.) (Parachutes, Air drop operations.) (Air force operations, Recovery, Radio beacons, Beacon lights, Markers, Sound ranging.)

Results are presented of the Blue Scout recovery vehicle drop-test program at the Atlantic Missile Range. A total of three tests were conducted in the period 4 to 9 November 1960. In general the drop-test program was successful, as all vehicles were recovered. The search and recovery in two tests utilized location aids installed in the vehicle for that purpose. Because of recovery aid malfunctions in the third test, the search effort was dependent on visual search techniques. The AMR drop-test program demonstrated the effectiveness of the recovery system design and operation. However, malfunctions in one test did indicate minor modifications were desirable to improve system reliability. Action was taken to incorporate these changes in the Blue Scout recovery vehicles. (Author)

AD-265 072 Div. 12
(TIPSW/RD) OTS price $8.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
SATELLITE-INDUCED IONIZATION OBSERVED WITH THE DOPLOC SYSTEM,
by Harold T. Lootens. Aug 61, 91p. incl. illus. tables, 19 refs. (BRL Memorandum rept. no. 1362)
(Army Proj. 503-06-011)
(ARPA Satellite Fence Series rept. no. 23)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, Tracking, *Doppler tracking, Detection.) (Clouds, Ionization, Gas ionization, Reflection.) (Gas ionization, Meteors, Reflection.)

A series of constant frequency doppler reflections obtained with the DOPLOC dark satellite tracking system are presented. These reflections, termed flats, are associated with satellite Doppler reflections and are of the type that would be received from a large, low velocity, ionized cloud. A tabulation of flats recorded at times other than satellite pass times is also given and a discussion of meteor-induced ionization is included. (Author)

AD-265 079 Div. 12
(TIPSW/RD) OTS price $1.60

Friez Instrument Div., Bendix Corp., Baltimore, Md.
DESIGN, DEVELOPMENT AND FABRICATION OF BAROSWITCH, REMOTE XM-10; BAROSWITCH, PRESET XM-11; AND CONTROL, BAROSWITCH SETTING: XT-4126.
Progress rept. no. 14, 1 Mar-31 May 61,
by W. J. Hughes. 3 June 61, 18p. incl. tables.
(Contract DA 36-034-ORD-2890)
Unclassified report

DESCRIPTORS: *Pressure switches, Barometric pressure, Manufacturing methods, Tests, Guided missiles.

Baroswitch, XM-10: Another set of vibration isolators has been received from Lord Manufacturing Company and will be tested within a couple of weeks. A complete summary of this test will be included in the next report. Approximately seventy elements have been assembled and are in the process of being ranged. Assembly of XM-10 baroswitches are anticipated to start in approximately two weeks. Baroswitch, XM-11: Twelve baroswitches have been assembled and are now being tested. It is anticipated that the new stainless steel baseplates will be machined, assembled and vibration tested during the next report period. A complete summary will be included in the next report. (Author)

AD-265 080 Div. 12
(TIPSW/RD) OTS price $1.10

Friez Instrument Div., Bendix Corp., Baltimore, Md.
DESIGN, DEVELOPMENT AND FABRICATION OF BAROSWITCH, REMOTE XM-10; BAROSWITCH, PRESET XM-11; AND CONTROL, BAROSWITCH SETTING: XT-4126.
Progress rept. no. 15, 1 June-31 July 61,
by W. J. Hughes. 4 Aug 61, 5p. incl. table.
(Contract DA 36-034-ORD-2890)
Unclassified report

DESCRIPTORS: *Pressure switches, Barometric pressure, Manufacturing methods, Tests, Guided missiles.

Baroswitch, XM-10: All subassemblies for the remaining baroswitches have been completed with the exception of the capsule assembly. A maximum effort is being expended to correct the difficulties in the capsule assembly and to obtain usable assemblies. No vibration studies were done due to Lord Manufacturing's failure to supply vibration isolators. It is anticipated that vibration work will be accomplished during the next report period. Baroswitch, XM-11: This phase of the program is progressing without any trouble, and it is anticipated that within one month all of the remaining XM-11 Baroswitches will be fabricated and in the testing phase. (Author)

AD-265 081 Div. 12, 22
(TIPSW/RD) OTS price $1.10

Friez Instrument Div., Bendix Corp., Baltimore, Md.
DESIGN AND DEVELOPMENT OF A REMOTE SETTING MINIATURE BAROSWITCH AND SETTER FOR USE IN GUIDED MISSILE ADAPTION KITS.
Rept. no. 11, 1-31 July 61,
by L. C. Friend and K. D. Shaub. 31 July 61, 5p.
(Contract DA 36-034-ORD-3284, Proj. no. 512-15-023)
Unclassified report

DESCRIPTORS: (*Pressure switches, Barometric pressure, Design, Hysteresis, Miniature electronic equipment, Remote control systems.) (Guided missile fuzes, Adapters, Pressure switches.)

Continued research is reported on the design of a baroswitch. Setting hysteresis of the baroswitch becomes severe with four elements installed due to friction in carriage guides. An arrangement using frictionless guides is being tested. Several elements with more rigid setting arms and better balanced contacts are being constructed. Gear train is being revised with more ratio to offset increased torque of dry operation. Size 5 motor-generator now available makes possible improved gear-train package. Potentiometers wound to pressure-altitude function for 33,000-ft range were received. The manufacturer states that a potentiometer for 68,000-ft range is also feasible. (Author)

AD-265 131 Div. 12
(TIPSA/WAW) OTS price $1.10

General Dynamics/Convair, San Diego, Calif.
A METHOD OF YAW ATTITUDE SENSING USING POLARIZED RADIO WAVES.
by J. F. Farrell. 27 Sep 61, 6p. incl. illus.
(Rept. no. ERR-SD-141)
Unclassified report

DESCRIPTORS: (*Satellite vehicles, *Yaw, Stabilization, *Satellite attitude.) (*Stabilization systems, Design.) (Stabilization systems, Radio equipment, Command systems.) Polarization, Radio waves.

A method of stabilizing yaw attitude of a satellite, particularly a stationary 24-hour satellite, is herein briefly described. The method utilizes a ground-based radio transmitting with a polarized antenna, and a polarized receiving antenna on the satellite. It appears that atmospheric refraction, Faraday rotation and the earth's magnetic field can be overcome in order to provide sufficient accuracy for ground-based control commands to the satellite propulsion system. (Author)

AD-265 156 Div. 12
(TIPSA/WAW) OTS price $7.60

General Dynamics/Convair, San Diego, Calif.
STUDIES PERTAINING TO BAMBI. SATELLITE STABILITY RESEARCH. VOLUME II.
Final rept.
Sep 61, 79p. incl. illus. (Rept. no. ZR-AP-061-20)
(Contract AF 04(647)644)
(ARPA Order no. 153-60)
(SSD TR 61-14) Unclassified report

DESCRIPTORS: (*Satellite vehicles, Stability, Control, Dynamics, Orbital flight paths, Mathematical analysis, *Aerodynamics.) (Stabilization systems, Mathematical analysis.) (Transients, Oscillation, Damping, Mathematical analysis.) (*Satellite attitude, *Control systems, Mathematical analysis.) Spin.

The attitude stability and control of a satellite which spins many times per orbit are investigated. Equations are derived and solved for the behavior of a spinning satellite in a circular orbit about a spherical earth. Gravity gradient is included in the equations. Active control means are considered for attitude control. Both active and passive methods of damping nutations are investigated. The effect of orbit precession and spin rate decay are discussed. (Author)

AD-265 173 Div. 12, 2, 25
(TIPSP/WH) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
MAXIMUM WINDS AND MISSILE RESPONSES,
by Henry A. Salmela and Arnold Court. Aug 61, 15p. incl. illus. 63 refs. (GRD Research notes no. 64; AFCRL-810)
Unclassified report

DESCRIPTORS: (*Guided missiles, Airframes, Stresses, *Shear stresses, Atmosphere, *Wind, Velocity.) (Structures, Deformation, Deflection, *Load distribution.) Meteorological data.

Maximum bending moments induced in a ballistic missile by the wind profile it would traverse are compared with the maximum wind speed at any level in that profile. The correlations of 0.85 and 0.66 for the two missiles studied indicate that maximum wind alone will not provide a perfect prediction of maximum bending moment. But use of a maximum wind threshold for a go-no-go rule can prevent most launch failures due to intolerable bending moments without sacrificing an appreciable number of successful launchings. (Author)

AD-265 244 Div. 12, 10
(TIPSW/CDM) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
AERODYNAMIC HEATING OF SIDEWINDER 1C SUSTAINER GRAINS,
by Howard C. Schafer. Oct 61, 11p. incl. illus.
(NOTS TP 2736)
(NAVWEPS Rept. no. 7762)
Unclassified report

DESCRIPTORS: (*Guided missiles, Air to air, *Aerodynamic heating, *Solid rocket propellants.) (Propellant grains, Heating, Combustion, Tests.) (Test equipment, Heaters, Instrumentation.) (Solid rocket propellants, Reliability, Heating.)

Sidewinder 1C sustainer grains were subjected to a heating cycle as follows: 130 F soak temperature; in 5 minutes raise motor tube skin temperature to 250 F and hold for 12 minutes; then raise to 350 F in 2 minutes and hold for 3 minutes; then cool to 250 F in 1 minute. The heating cycle was the basis of a test series, with the heat provided by a hexagonal oven consisting of six radiant heating panels. Detailed effects on the sustainer grain are described after a successful test, which, in a series, ran through five of the heating cycles. (Author)

AD-265 374 Div. 12
(TIPSP/MFA) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
ROTATION OF RE-ENTRY NOSE CONE,
by V. V. Sychev. 10 Oct 61, 3p. (Trans. from Prikladnaya Matematika I Mekhanika, 25:600-610, 1961; AID rept. no. 61-141)
Unclassified report

DESCRIPTORS: (*Re-entry aerodynamics, *Re-entry vehicles, Aerodynamic heating.) (Heat transfer, Gas flow, Thermodynamics, Pressure, Enthalpy.) (USSR, Translation.)

The possibility of rotating a re-entry nose cone in order to combat aerodynamic heating is discussed. (Author)

AD-265 375 Div. 12
(TIPSW/NTM) OTS price $2.60

Air Force Special Weapons Center, Kirtland Air Force Base, N. Mex.
LOWER LIMIT ON BOOSTER REQUIREMENTS TO ORBIT AND SUBSEQUENTLY DE-ORBIT A PAYLOAD,
by Ronald R. Harrington. Oct 61, 22p. incl. illus. tables (AFSWC TN 61-38)
(Proj. 7812) Unclassified report

DESCRIPTORS: (*Booster rockets, Effectiveness, Thrust, Velocity.) (Satellite vehicles, *Launching.) (Orbital flight paths, Mathematical analysis.) Re-entry aerodynamics, Deceleration.

A study is presented of a simplified approach to the calculation of minimum booster requirements for a typical earth-launched orbit and subsequent deorbit mission. It is intended primarily as an introduction to the orbital mechanics of such a mission. A two-dimensional inverse square force field centered within a circular nonrotating earth is assumed. The propulsion mechanism is assumed to be 100 percent efficient and capable of directing thrust into any direction. At any instant the masses present are those of useful payload and unburned propellant with no mass assumed for dead casing weight. Atmospheric losses are neglected. The results establish the lower limit on velocity increments below which the mission cannot be accomplished. (Author)

AD-265 426 Div. 12
(TIPSP/MFA) OTS price $1.60

Naval Postgraduate School, Monterey, Calif.
OPTIMUM INTERCEPTION OF A BALLISTIC MISSILE AT INTERMEDIATE RANGE,
by Frank D. Faulkner. Oct 61, 15p. (Research paper no. 29; Boeing Airplane Co., rept. no. DS-11641)
Unclassified report

DESCRIPTORS: (*Interception of Ground controlled interception systems, Aircraft intercept control systems, *Surface to surface, *Guided missiles at Range.) (Motion, Guided missile trajectories, Guided missile computers, Digital computers, Linear programming.) (Numerical analysis, Numerical methods and procedures, Calculus of variations, Differential equations.)

The problem of obtaining optimum trajectories is studied, such as the one for effecting interception of a target following a known course above the sensible atmosphere, with minimum fuel consumption, or in minimum time. A procedure is given for determining the trajectory on a digital computer, and some conditions are given for the corresponding optimum trajectories. The methods apply generally to problems wherein the range and time are not too great and the terminal velocity is irrelevant. (Author)

AD-265 488 Div. 12, 15
(TIPSP/MFA) OTS price $4.60

Naval Ordnance Test Station, China Lake, Calif.
MOTION OF A ROTATING BODY--A MATHEMATICAL INTRODUCTION TO SATELLITE ATTITUDE CONTROL,
by Roy Dale Cole, M. E. Ekstrand and Michael R. O'Neill. 10 Apr 61, 48p. incl. illus. (NOTS TP 2620)
(NAVWEPS rept. no. 7619)
Unclassified report

DESCRIPTORS: (Satellite vehicle research, Satellite vehicles, *Mathematical analysis, *Satellite attitude, *Control test vehicles, Rotating structures.) (Equations, Differential equations, Real variables, Integration.) (Theory, Gyroscopes, Motion, Torque, Damping, Oscillations, Azimuth, Velocity, Spin.)

The primary aspects of attitude control are (1) how given torques affect the orientation of a rigid body and (2) what torques are necessary to orient a rigid body in a given manner. Both problems are treated, the emphasis being on a mathematical method of obtaining torques that will give a specified motion. Included for convenient neference are formulas, definitions, and specific examples basic to later analysis. (Author)

13. INSTALLATIONS AND CONSTRUCTION

AD-264 790 Div. 13, 22
(TIPSW/NTM) OTS price $1.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
SHELF LIFE TEST OF INCENDIARY. EMERGENCY DOCUMENT DESTROYER (E12R1).
Airmunitions test rept.,
by Joseph W. Holden. Sep 61, 12p. incl. illus. table (OOY TR 61-38)
Unclassified report

DESCRIPTORS: (*Destructors, Incendiary ammunition, Storage, Life expectancy.) (*Paper, Disposal, *Incinerators.)

This test was conducted to determine if the storage life of the M3 incendiary emergency document destroyer could be extended. The shelf life was five years at the time this test was conducted. The storage requirements were at ambient atmospheric conditions. Thirty samples, nearly six years old, were used in this test. Ten samples each that had been stored in three different climatic conditions were tested. All samples that were tested functioned normally. Samples from the more humid climate indicated that moisture was present or had been present. The sodium nitrate in these samples was caked solid. When the sodium nitrate was broken up, it functioned properly. Any legible ash in the residue was completely destroyed by a vigorous stirring, approximately two hours after starting the fire. It is recommended that the shelf life of the M3 incendiary emergency document destroyer be extended from five years to eight years. It is further recommended that additional tests be conducted when the items are 7 1/2 years old. (Author)

AD-264 994 Div. 13, 8
(TIPSE/CRJ) OTS price $5.60

IMC Magnetics Corp., Westbury, Long Island, N. Y.
DEVELOPMENT OF COOLING DEVICE IN ACCORDANCE WITH BUREAU OF SHIPS CONTRACT SPECIFICATIONS SHIPS-B-3575 DATED 11 JAN, 1960.
Interim development rept., 1 Jan-31 Aug 61. 1961, 49p. incl. illus. tables.
(Contract NObsr-81526)
Unclassified report

DESCRIPTORS: (Electric motors, Blowers, *Air conditioning equipment, *Cooling fans, Shipborne, Design.) (*Electronic equipment, Shipborne, Cooling, Air cooled.)

A dual winding motor blower combination was successfully built (designated by IMC Part No. BC1607B-6), which operates from a single capacitor, and gives a reduction in temperatures of between 5% and 25% in the Synthesizer. A new lamination was designed, using a double bar deep slot rotor and is under test. First results indicate a very substantial improvement in air delivery and reduction in input wattage. Results are detailed. (Author)

AD-265 061 Div. 13, 4
(TIPSB/CCH) OTS price $7.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
WATER DEMINERALIZATION AND DECONTAMINATION STUDIES UTILIZING ELECTRODIALYSIS.
Rept. for Aug 58-Nov 59,
by Paul E. DesRosiers, Jr. 9 May 61, 73p. incl. illus. tables, 13 refs. (Technical rept. no. 1671-TR)
(Proj. 8M75-05-001-06)
Unclassified report

Original contains color plates: All ASTIA reproductions will be in black and white. The original may be seen in ASTIA Hq.

DESCRIPTORS: (*Purification and Decontamination, *Water.) (Separation of Salts, Ions by *Electrodialysis.)

Laboratory and field tests were made of an electrodialysis process for removal of ionized salts from brackish waters. The unit tested was

a Model 30-B procured from Ionics, Inc., Cambridge, Mass. Laboratory tests were conducted at Fort Belvoir to determine the following: (1) suitability of operational features to military usage; (2) performance characteristics of process; (3) effect of changes in temperature, pH, and feed salinity on performance; and (4) factors reducing effectiveness of the ion-selective membranes. Tests were conducted in Nevada to determine the behavior of the demineralizer in the field when removing dissolved mineral matter from brackish well water and to determine the capability of the unit for removal of soluble radioactivity from water. (Author)

14. MATERIALS (NON-METALLIC)

AD-264 768 Div. 14, 7
(TIPSM/BRW) OTS price $5.60

Owens-Corning Fiberglas Corp., Granville, Ohio.
DEVELOPMENT OF FIBERMIX EXTRUDABLE INSULATION.
Final rept.
1961, 54p. incl. illus. tables.
(Contract NOa(s) 60-6017-c)
Unclassified report

DESCRIPTORS: (Copper wire, Electric wire, Extrusions on Plastic coatings, *Insulating materials, *Electric insulation, Resins, Vinyl chlorides, Nylon coatings, Synthetic rubber, Silicone resins, Ethylenes, Fluorides, Polymers, Impregnation of Glass, Particles of Glass textiles.) (Military requirements, Electrical properties, Dielectric properties, Physical properties, Abrasion, Stability, Temperature, Tests, Test methods.)

The contribution of the woven glass braid layer in wires such as Type II, MIL-W-5086A wire was found to be positive physical spacing from ground or from adjacent wire when the primary insulation was destroyed. A polyvinylchloride compound filled with 60% glass-flake is not able to provide the positive physical spacing accomplished by the glass braid layer. The glass-flake, however, enables the polyvinylchloride to survive many of the severe tests to which the Type II wire was subjected without destruction of the primary insulation. The addition of glass flake to silicone rubber for extrusion on wire increases the short-term thermal life of the insulation. Teflon 100 (FEP) was not aided, in any of the tests performed, by the addition of glass-flake, but in Teflon 6 (TFE) high temperature shrinkage was greatly reduced. (Author)

AD-264 775 Div. 14
(TIPSW/NTM) OTS price $1.75

Plastics Technical Evaluation Center, Picatinny Arsenal, Dover, N. J.
SUBJECT INDEX, BIBLIOGRAPHY, AND CODE DESCRIPTION OF TECHNICAL CONFERENCE PAPERS ON PLASTICS, MARCH 1960-FEBRUARY 1961,
by Arnold E. Molzon. July 61, 69p. incl. table.
(Plastec rept. no. 8)
Unclassified report

DESCRIPTORS: *Plastics, *Bibliography, Conferences, Materials, Indexes, Polymers, Physical properties, Mechanical properties.

The papers presented at the technical conferences on plastic materials and related technology, have been listed and indexed by subject. Papers (500) from 14 conferences are covered. Included are a bibliography, and identification of the company affiliations of the authors. The conferences were: Spring and Fall meetings, American Chemical Society (Division of Paint, Plastics, and Printing Ink Chemistry); 3d Annual Conference on the Application of Electrical Insulation; 15th Annual Meeting of the American Rocket Society; Industrial Glass Fabric Design Engineering Symposium; Symposium on Processing Materials for Re-entry Structures; 17th Annual Technical Conference of the Society of Plastics Engineers; Conference on Plastics in Business Machines; Conference on Plastic vs. Corrosion; 16th Annual Technical and Management Conference of the Reinforced plastics Division of the Society of the Plastics Industry; 6th JANAF Conference on Elastomer Research and Development; 9th Annual Conference on Technical Progress in Communication Wire and Cable; National Academy of Science Conference on Electrical Insulation; and Conference on Coatings for the Aerospace Environment. (Author)

AD-264 776 Div. 14, 8
(TIPSM/BRW) OTS price $4.60

New Jersey Ceramic Research Station, Rutgers U., New Brunswick.
DEVELOPMENT OF REFRACTORY CERAMICS THAT CAN BE PROCESSED AT TEMPERATURES CONSIDERABLY LOWER THAN THEIR MAXIMUM USE TEMPERATURE.
Quarterly progress rept. no. 3, 1 June-1 Sep 61,
by Edward J. Smoke and John H. Koenig. 1 Sep 61,
41p. incl. illus. tables.
(Contract NOw 61-0211-c)
Unclassified report

DESCRIPTORS: (*Radomes, Materials, Processing, Temperature, *Refractory materials, *Ceramic materials, Aluminum compounds, Magnesium compounds, Silicon compounds, Oxides, Mixtures, Sintering, Density, Porosity.) (Magnesium compounds, Carbonates, Nitrates, Fluorides.) (Aluminum compounds, Oxides, Oxychlorides.)

Effort was made to study techniques and compositions for producing radome materials which can be fabricated at temperatures considerably below their use temperature and yet maintain all desirable engineering properties. The high alumina bodies were evaluated that were fabricated with magnesium carbonate and magnesium fluoride as sources of magnesium oxide. Aluminum oxide-oxychloride was substituted for the alumina in a high alumina body which resulted in a very high density body. The role of grain growth inhibitors and promoters in alumina compositions is investigated. (Author)

AD-264 812 Div. 14, 31
(TIPSM/SEB) OTS price $3.60

David Taylor Model Basin, Washington, D. C.
REINFORCED PLASTICS FOR HYDROSPACE VEHICLES,
by J. E. Buhl, Jr., J. G. Pulos, and W. R. Graner. Aug 61, 33p. incl. illus. tables (Rept. no. 1524)
Unclassified report

DESCRIPTORS: (Reinforcing materials, *Glass textiles, *Plastics, *Submarine hulls, Tests.) (Specifications, Pressure, Stability, Density, Shear stresses, Fatigue (Mechanics), Corrosion, Elasticity.) (Test equipment, Structural shells, Cylindrical bodies, Stiffened cylinders, Laminates, Resins, Epoxy resins, Adhesive tapes, Filament wound construction, Hydrostatic pressure, Failure (Mechanics), Tests.)

The paper presents background information on the use of glass-reinforced plastics for the construction of pressure hulls for deep submergence. The characteristics of an ideal material for hulls for deep-depth operation are described, and available information on structural response to static loading of cylindrical hulls made of glass-filament reinforced plastics is summarized to demonstrate their potential advantages over metals. Work to date indicates that experimentally determined pressures obtained from a limited number of tests of structural models fabricated from commerically available materials agree well with pressures computed from formulas based on thin-shell theory for isotropic materials. (Author)

AD-264 842 Div. 14, 26
(TIPSM/BRW) OTS price $1.10

Vermont U., Burlington.
THE INFLUENCE OF CURE TEMPERATURES AND PRELOAD ON THE ENVIRONMENTAL RESISTANCE OF REINFORCED PLASTICS,
by John O. Outwater and Joseph Matta. 1 Sep 61, 7p. (Technical memo. no. 164)
(Contract Nonr-321901)
Unclassified report

DESCRIPTORS: (*Laminates, *Plastics, Resins, Glass textiles, Reinforcing materials, Filament wound construction.) (Processing, Heat treatment, Stresses, Temperature, Tensile properties, Failure (Mechanics), Shear stresses, Mechanical properties.)

NOL-type rings were prepared at different cure temperatures. Some of these rings were subjected to different degrees of preload in flexure before being subjected to different environmental conditions. The results showed that the optimum cure temperature for the resin system used was 350 F and that the degree of preload had no significant effect on the environmental resistance of these particular laminates or on its proportional limit. (Author)

AD-264 893 Div. 14
(TIPSB/LH) OTS price $7.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
SOLID FILM LUBRICANTS: AN ANNOTATED BIBLIOGRAPHY.
Addendum to the Space Materials Handbook, comp. by Helen M. Abbott. Sep 61, 71p. (Special bibliography no. SB-61-48; 3-34-61-11)
(Contract AF 04(647)673)
Unclassified report

DESCRIPTORS: (*Bibliography, *Lubricants, Solids, Materials.) (Metal films, Ceramic materials, Plastics, Graphite.) (Molybdenum compounds, Sulfides.)

This annotated bibliography was compiled as the result of a search on material problem areas for spacecraft systems where friction and wear of rubbing or sliding surfaces are encountered and on lubricants needed to reduce frictional drag and minimize the power required to drive the mechanisms. Studies have been conducted on dry lubricants, and in particular the laminar solids such as graphite and molybdenum disulfide. References on other laminar compounds, plastics, ceramics and metal films for use as solid film lubricants were also evaluated. (Author)

AD-264 898 Div. 14, 3
(TIPSB/LH) OTS price $1.60

Institute of Paper Chemistry, Appleton, Wis.
DEVELOPMENT OF AN IMPROVED DIFFUSION BOARD MATERIAL.
Monthly progress rept. no. 12, 29 Aug-28 Sep 61. 25 Oct 61, 12p. incl. illus. tables.
(Contracts DA 18-108-405-cml-941 and DA 18-108-cml-6561)
Unclassified report

DESCRIPTORS: (*Fiberboard, *Wood pulp fibers, Wood pulp, Paper, Additives, Charcoal, Water, Absorption, Aging, Deterioration, Cyanogen chlorides, Fungicidal coatings.) (*Shelters, Fiberboard, Chemical warfare agents, Poisonous gases.)

Boards have been prepared in the laboratory which meet the general objectives of this program in all respects except for lack of adequate stability of cyanogen chloride protection when aged under tropical conditions. Aging at desert conditions has little effect on the cyanogen chloride protective features and exposure at tropical conditions has little effect upon the protective features against chloropicrin. Variations in pulp characteristics, addition of sizing materials, and other factors may influence this rate of aging but the correlations are far from clear. According to available information the stability of the charcoal itself is limited under these conditions. A proposal for review of the mechanism of cyanogen chloride protection with respect to the influence of pulp variables and sizing additions is beyond the scope of the present program but a proposal for an extension of this type has been submitted. Boards were prepared to test the concept of critical bed depth as a means of compensating for variations in charcoal loading. The data is not sufficiently consistent to prove or disprove a definite relation of CK life to charcoal loading at the assumed relationship of 26.5 min./g. of charcoal per 100 sq. cm. of board but does not show that the available data can be represented by this relationship. (Author)

AD-264 930 Div. 14, 4
(TIPSM/SEB) OTS price $1.10

Harris Research Labs., Washington, D. C.
ACCELERATED DETERIORATION OF TEXTILES.
Bimonthly progress rept. no. 3, 1 Aug-30 Sep 61, by Charles A. Rader and Anthony M. Schwartz. 16 Oct 61, 5p. tables.
(Contract DA 18-108-cml-6606)
Unclassified report

DESCRIPTORS: (*Textiles, Deterioration, Oxidation, Light, Measurement.) (Acceleration of Deterioration by Ions, Iron, Cerium, Titanium.) (Determination, Analysis of Heat as Catalysts in Deterioration.) (*Cotton textiles, *Cellulose.) Photochemical reactions, Test methods, Tests.

Reasons for the difference in photooxidative degradation between cellophane and cotton were investigated. Uranyl oxalate actinometers were used to measure quantitatively the amounts of light transmitted and reflected by the cellophane and cotton. Cellophane containing 0.2% ferric ion, absorbed about 5% of the light. Cotton fabric containing 0.2% ferric ion absorbed more light than the cellophane, but no accurate measurements could be made. Tests were conducted on the acceleration of degradation by heat absorption in cotton and cellophane samples impregnated to equal contents of ferric ion. Tests were on the following degradation accelerators; ferrocene (dicyclopentadienyl iron), dicyclopentadienyl titanium dichloride, ceric ion, and cerous ion. In the limited experiments to date it has been found that cerium, applied to cotton either as cerous ion or as ceric ion, does promote photodegradation. (Author)

AD-264 974 Div. 14, 25
(TIPSM/BRW) OTS price $2.60

Cornell Aeronautical Lab., Inc., Buffalo, N. Y.
AN INVESTIGATION OF THE THEORETICAL AND PRACTICAL ASPECTS OF THE THERMAL EXPANSION OF CERAMIC MATERIALS.
Quarterly progress rept. 1 Jan-31 Mar 61, by W. Richard Brown and Henry P. Kirchner. 31 Mar 61, 25p. incl. illus. tables (Rept. no. PI-1273-M-10)
(Contract NOrd-18419)
Unclassified report

DESCRIPTORS: (*Ceramic materials, *Rare earths, Transition elements, Scandium, Yttrium compounds, Erbium, Dysprosium, Oxides, *Thermal expansion, Measurement by X-ray diffraction analysis.) (Crystal structure, Molecular structure, Lattices, Mathematical prediction.) (Silver, Thermal expansion, Lattices.)

The thermal expansion coefficients of 4 members of the homologous series of cubic rare earth oxides were measured, and plotted against the openness ratios and the molar volumes calculated for each oxide. Thermal expansion coefficient appears to increase with decreasing openness ratio or molar volume in going from Sc_2O_3 to the true rare earth oxides, but within the sub-series of true rare earth oxides (Sm_2O_3 to Lu_2O_3), the expansion coefficient appears to be nearly constant. Other homologous series might show a similar two-part behavior. Procedures used in estimating the precision and accuracy of expansion coefficient determination by x-ray diffraction were discussed. With Cu radiation, the estimated accuracy for most of the materials of interest is + or - 1.3 x 10 to the -7th power/degree C or less, over the range 25 to 1000 C. With Cr radiation, the estimated accuracy is + or - 1.4 x 10 to the -7th power/degree C, over the range 25 to 1200 C, and + or -1.7 x 10 to the -7th power/degree C or less, over the range 25 to 1000 C. (Author)

AD-265 033 Div. 14, 10, 16
(TIPSB/CCH) OTS price $3.60

Prevention of Deterioration Center, National Research Council, Washington, D. C.
BIBLIOGRAPHY ON MICROORGANISMS AFFECTING PETROLEUM AND PETROLEUM PRODUCTS INCLUDING REPORTS ON SULFATE-REDUCING BACTERIA.
3 Aug 61, 35p.
Unclassified report

DESCRIPTORS: (*Bibliography on *Microorganisms and *Fungi, *Contamination, Deterioration, Fungus deterioration, Corrosion of *Fuels, Fuel storage tanks, Pipes, *Petroleum, Hydrocarbons, Gasoline, *Lubricants, Oils, Oil tanks, *Liquid rocket propellants, Metals, Materials.) (*Inhibition, *Corrosion inhibition, Coatings.) Bactericides, Fungicides.

A list of references is presented on (1) the characteristic behavior of specific types of anaerobic, aerobic, pathogenic types of bacteria, and fungi, (2) the effects of producing contaminant residue, deterioration, corrosion of pipelines, materials oil emulsions, gasoline, lubricants, linings of fuel storage tanks, metals, and other container-type storage devices, and (3) the development of bacterial and fungal inhibitors such as bactericides, fungicides, and other types of countermeasures such as coatings and resistant additives. Many foreign reports of French, German, Italian and Russian origin are presented.

AD-265 074 Div. 14, 27, 12
(TIPSM/BRW) OTS price $1.10

Bendix Products Div., Bendix Corp., South Bend, Ind.
SERVICES TO GENERATE BASIC ENGINEERING DATA ON THE BEHAVIOR OF PLASTIC COMPOSITE STRUCTURES UNDER VARIOUS CONDITIONS OF STRESS.
Monthly progress rept. no. 7, 1-30 Sep 61, by F. P. Weldy. 13 Oct 61, 4p. illus.
(Contract NOw 61-0488-c)
Unclassified report

DESCRIPTORS: (*Plastics, Structures, *Rocket cases, Pressure vessels, Reinforcing materials, Glass textiles, Resins, Laminates, Filament wound construction, Adhesive tapes.) (Failure (Mechanics), Rupture, Stresses, Hydrostatic pressure, Tests.)

The effort included fabrication of 3 pressure cases and the testing of the first bending specimen along with the D rings associated with the above cases. The design was finalized for the 18 in. case assembly with four nozzle ports. The configuration is similar to the SM-1 design no. 6 fiberglass rocket case. (Author)

AD-265 153 Div. 14
(TIPSM/EJH) OTS price $3.60

Fabric Research Labs., Inc., Boston, Mass.
SOME EFFECTS OF BLEND ON STRUCTURE,
by Myron J. Coplan. 18 Oct 61, 33p. incl. illus. tables (Technical rept. no. 8)
(Contract Nonr-142200)
Unclassified report

DESCRIPTORS: (*Woolen textiles, *Synthetic fibers, Threads, Fibers, Nylon, *Nylon thread, Rayon fiber, Rayon thread, Cellulose, Military requirements.) (*Fibers, *Synthetic fibers, Geometry, Configuration, Structures, Physical properties, Mechanical properties, Tensile properties, Elasticity, Deformation, Density, Test methods.)

Studies were made of the geometry of blended woolen yarns and the data applied in the description and analysis of the tensile and flexural behavior of the yarns. Fiber crimp contributes to the low load tensile softness of a yarn. Fiber and yarn elastic recovery from tension follow each other very closely except that geometric effects may tend to distort the behavior of blended yarns out of proportion to

blend composition. Tensile strength of blended yarns can be predicted. Packing density of yarns is influenced by yarn twist and blend composition. The flexural rigidity of yarns ranges from slightly less than to about double or triple the theoretical sum of fiber rigidities. The general trends with twist and blend can be explained and related to the packing density. (Author)

AD-265 154 Div. 14
(TIPSM/EJH) OTS price $3.60

Fabric Research Labs., Inc., Boston, Mass.
THE MECHANICS OF BENDING AND WRINKLING IN WOOL-DACRON WORSTED FABRICS,
by Norman J. Abbott and Myron J. Coplan.
25 Oct 61, 33p. incl. tables (Technical rept. no. 9)
(Contract Nonr-142200)
Unclassified report

DESCRIPTORS: (*Woolen textiles, *Dacron, Fibers, Synthetic fibers, Threads.) (*Fibers, *Synthetic fibers, Mechanical properties, Deformation, Moisture, Test methods.) Processing, Preparation.

The addition of 50% of Dacron to wool in a light weight worsted fabric provides a lack of sensitivity to the adverse effects of high humidity which is almost as great as that possessed by fabric made from 100% Dacron. This should result in an improved appearance during wear, even under adverse humidity conditions. The use of a coarser than normal wool fiber for these light constructions also proved successful, the behavior being essentially as good for 56's quality as for 64's quality wool. A mechanistic analysis of the data provided a further understanding of the specific function of the non-swelling fiber in the blend. (Author)

AD-265 189 Div. 14, 27
(TIPSM/REB) OTS price $7.60

Little, Arthur D., Inc. Cambridge, Mass.
PYROLYTIC REFRACTORY MATERIALS FOR SOLID-FUEL ROCKET MOTOR APPLICATIONS,
by R. Francis and E. P. Flint. 10 Aug 61, 73p. incl. illus. tables, 38 refs.
(Contract DA 19-020-ORD-5238)
(WAL TR 766.41/1) Unclassified report

DESCRIPTORS: (*Refractory materials, *Refractory coatings, *Graphite, *Boron compounds, *Nitrides, Preparation, Pyrolysis, Vaporization, Deposits.) (Vapors, Deposits of Carbides, Borides, Silicides, Alloys, Halides, Metals.) (Pyrolysis of Organic compounds, Metalorganic compounds.) (Tests, Chemical analysis, Infrared spectroscopy, X-ray diffraction analysis, Microscopy, Density, Hardness, Thermal radiation.) (Laboratory equipment, Design.) (Rocket motors, *Rocket cases, Solid rocket propellants.) Crystals.

Results of an experimental program devoted to the development of refractory materials formed by pyrolytic processes are described. In this regard the relative merits of various pyrolysis techniques and furnace designs are critically evaluated, and optimum conditions for the formation of pyrolytic graphite and pyrolytic boron nitride have been investigated. Relevant properties of pyrolytic graphite and pyrolytic boron nitride are compared, and application of the principles derived has resulted in the formation of several large sound shapes of these materials. Exploratory experiments on the formation of other pyrolytic systems are also described. (Author)

AD-265 191 Div. 14, 4
(TIPSM/EJH) OTS price $6.60

New York U. Coll. of Engineering, N. Y.
RESINS BASED ON COMPLEX FORMATIONS WITH ORGANO-TITANATES.
Final rept.
17 Mar 61, 62p. incl. illus. tables.
(Contract NOa(s) 60-6006-c)
Unclassified report

DESCRIPTORS: (*Acrylic resins, *Epoxy resins, *Epoxides, *Resins, Metalorganic plastics, Silicone resins, Heat resistant polymers, Coatings, Organic coatings, Plastic coatings, Steel, Metals.) (*Polymers, Complex compounds, Chelate compounds, Synthesis, Polymerization, Copolymerization, High temperature research.) (*Metalorganic compounds, Propyl radicals, *Titanates, Zinc compounds, Silicones, Aluminum compounds.) Chemical reactions, Tests, Electron microscopy.

Reaction products of tetraalkyl titanate with an alcoholic unsaturated cyclic compound of the bornene class and the introduction of epoxy groups into the the tetraalkyl titanate are discussed. Other new resins described are based on the interreaction of fluid titanate/basic zinc octoate complexes, either with reactive groups attached to ethoxy silanes or with an aluminum sec.butoxide diisopropoxide; i.e., new resinuous products containing Ti as well as Zr and one third metal, either silicone or aluminum, are discussed. (Author)

AD-265 192 Div. 14
(TIPSM/BRW) OTS price $2.60

Narmco Industries, Inc., San Diego, Calif.
ESTABLISHMENT OF THE POTENTIAL OF FLAKE REINFORCED COMPOSITES AS ENGINEERING STRUCTURAL MATERIALS.
Quarterly rept. no. 1, 1 Jan-31 Mar 61,
by Leonard P. Suffredini. Apr 61, 24p. incl. illus. tables.
(Contract NOw 61-0305-c)
Unclassified report

DESCRIPTORS: (*Laminates, *Reinforcing materials, *Glass, Plastics, Resins, Mechanical properties.) (Test methods, *Disks of Glass, Load distribution, Moments, Stresses, Deformation, Equations, Mathematical prediction, Mathematical analysis, Tensile properties.) (Glass, Films, Tensile properties, Determination.)

An analysis of the moment distribution on a uniformly loaded circular plate with edges overhanging the support is presented. The equations developed are used to calculate the maximum tensile stress and deflection in such a loaded plate. These equations are intended for the evaluation of the flexural strength of flake reinforced plastic laminates under biaxial stress. The notched tensile strength of flake laminates is reported. The results are interpreted in terms of built-in stress raisers caused by local variations in the distribution of flake. Tensile stress at root of the notch has reached a level of 58,000 psi. (Author)

AD-265 194 Div. 14, 4
(TIPSM/SEB) OTS price $2.60

Midwest Research Inst., Kansas City, Mo.
SYNTHESIS OF ELASTOMERS CONTAINING Si-N BONDS IN THE MAIN CHAIN.
Quarterly progress rept. no. 1, 29 June-29 Sep 61,
by L. W. Breed and R. L. Elliott. 29 Sep 61,

28p. incl. tables, 52 refs.
(Contract DA 23-072-ORD-1687)
Unclassified report

DESCRIPTORS: (*Heat-resistant polymers, *Elastomers, *Silicon compounds, *Nitrogen compounds, Chemical bonds, Synthesis.) (Polymers, Silanes, Nitrogen compounds, Cyclopentane, Cyclohexanes, Preparation.)

The objective of the program is to develop syntheses for thermally and hydrolytically stable elastomers based on chains containing silicon atoms bonded directly to nitrogen, and to conduct preliminary evaluation of the materials obtained. 2,2-Dimethyl-1,3-bis (chlorodimethylsilyl)-1,3-diaza-2-silacyclopentane (I) and the corresponding diazasilacyclohexane (II) derivative were prepared. Products from the interaction of dichlorodiphenylsilane and dichloromethylphenylsilane with ethylenediamine, 1,3-propylenediamine, and o-phenylenediamine were obtained. The NH_3, $MeNH_2$, and aniline derivatives of I and II have also been prepared and tentatively identified. The report includes a review of the literature on Si-N polymers. (Author)

AD-265 241 Div. 14, 26
(TIPSM/SEB) OTS price $1.60

Narmco Industries, Inc., San Diego, Calif.
POTENTIAL OF FILAMENT WOUND COMPOSITES.
Monthly progress rept. no. 7, 1-30 Sep 61, by C. Y. Chia, B. Duft, and S. Dharmarajan.
Sep 61, 16p. incl. illus.
(Contract NOw 61-0623-c)
Unclassified report

DESCRIPTORS: *Beams, *Reinforcing materials, Fibers, Filaments, Resins, Plastics, *Laminates, *Filament wound construction, Elasticity, Tensile properties, Deformation, Deflection, Moments, Shear stresses, Stresses, Theory, Mathematical analysis, Equations.

Theoretical relations for flexural rigidity and modulus of elasticity at any point have been derived for composite beams with fibers in all laminations oriented at an arbitrary angle, and for composite beams with fibers in alternate laminations at different angles with the longitudinal axis of the beam. (Author)

AD-265 263 Div. 14
(TIPSM/BRW) OTS price $3.60

Narmco Industries, Inc., San Diego, Calif.
ESTABLISHMENT OF THE POTENTIAL OF FLAKE REINFORCED COMPOSITES AS ENGINEERING STRUCTURAL MATERIALS.
Quarterly progress rept. no. 2, 1 Apr-1 July 61, by C. Y. Chia, B. L. Duft, and D. Stevens.
July 61, 31p. incl. illus. tables.
(Contract NOw 61-0305-c)
Unclassified report

DESCRIPTORS: (*Laminates, *Reinforcing materials, *Glass, *Mica, Plastics, Resins, Mechanical properties, Electrical properties.) (Test methods, Disks, Glass, Load distribution, Stresses, Deformation.) (Laminates, Epoxy resins, Glass, Mica, Tensile properties, Dielectric properties.)

An evaluation of geometric concentration effects on circular lap joints was conducted. This included the development of methods of analyzing circular lap joints, and, experimental verification of concentration factors at the edge of the flake as high as 4. The notch sensitivity of flake reinforced composites was evaluated. Although flake reinforced composites behave as brittle materials, they were determined to be relatively insensitive to notches, experimentally. The electrical properties of glass flake reinforced composites and mica flake reinforced composites were evaluated and compared. Mica flake composites appear to be as good as glass flake composites. (Author)

AD-265 285 Div. 14, 4
(TIPSM/EJH) OTS price $5.60

New York U., Coll. of Engineering, N. Y.
RESINS BASED ON COMPLEX FORMATIONS WITH ORGANO-TITANATES.
Technical rept. no. 7, 16 Sep 60-15 Jan 61.
15 Jan 61, 52p. incl. tables.
(Contract NOa(s) 60-6006-c)
Unclassified report

DESCRIPTORS: (*Acrylic resins, *Epoxy resins, *Epoxides, *Resins, Metalorganic plastics, *Silicone resins, *Heat resistant polymers, Coatings, *Organic coatings, Plastic coatings, Steel, Metals.) (*Polymers, Complex compounds, Synthesis, Polymerization, Copolymerization, High temperature research, Stability.) (Chemical reactions, Propyl radicals, *Titanates with Monocyclic compounds, Acrylic resins or Vinyl radicals, Cyclohexenes, Dioxides or *Metalorganic compounds, Alkoxy radicals, Silanes and *Anilines.)

Several groups of titanate resins are being studied: a group derived from reactions between tetraalkyl titanate and a norbene-derived new acrylate; and a group from a fluid reaction product of the tetraalkyl titanate and basic zinc octoate with ethoxy silanes. Considerable work was performed on the resinous compounds derived from reacting tetraalkyl titanate with a vinyl cyclohexene dioxide (Epoxide 206) and on its modifications with an aromatic amine or with maleic acid. The cross linking effect of this titanate epoxide on organic resins, such as on two different forms of epoxy resins and on ethylene glycol dimethacrylate was studied. And chemical interreaction of this titanate epoxide and of its vapors with a steel surface has been observed and used for priming purposes on such surface. (Author)

AD-265 286 Div. 14, 29
(TIPSB/CCH) OTS price $1.60

Quartermaster Research and Engineering Command, Natick, Mass.
MOISTURE PERMEABILITY INDEX - A NEW INDEX FOR DESCRIBING EVAPORATIVE HEAT TRANSFER THROUGH FABRIC SYSTEMS,
by A. H. Woodcock. June 61, 12p. incl. illus. tables (Technical rept. no. EP-149)
Unclassified report

DESCRIPTORS: (*Indexes, Theory of Semipermeability of *Moisture, Insulating materials, Clothing, *Heat transfer, Evaporation, Temperature, Tests, Mathematical analysis.)

From theoretical considerations a new clothing parameter, moisture permeability index, has been developed. The existing clo formula relating dry clothing insulation and ambient temperature to man's heat loss has been extended to include evaporative heat transfer. This extension indicates a range over which the clothed man may maintain thermal equilibrium. This concept of range applies in all types of environments and

thus one theory is applicable to hot, temperate, and cold environments. The theory also indicates the limitations of sweat evaporation as a cooling mechanism. A method is described for measuring moisture permeability index. (Author)

AD-265 298 Div. 14, 26, 27
(TIPSM/SEB) OTS price $1.60

Rocketdyne, Canoga Park, Calif.
PREIMPREGNATED ROVING STUDY.
Monthly progress rept. no. 6, 31 Aug-30 Sep 61. 15 Oct 61, 13p. incl. illus. (Rept. no. 61RC15243)
(Contract NOw 61-0498-c)
Unclassified report

DESCRIPTORS: (*Rocket cases, *Propellant tanks, *Filament wound construction, Processing.) (*Fibers, Synthetic fibers, Resins, *Epoxy resins, Impregnation, Storage, Freezing, Aging, Temperature, Pressure, Hydrostatic pressure, Mechanical properties, Tensile properties, Measurement, Tests.) (*Cylindrical bodies, Processing, Wire-winding machine.)

The investigation of the strand tensile strength of uncured preimpregnated roving was continued. Additional data are presented on the effects of multiple-pulley feed systems. The aging study, investigating the effect of refrigerated and deep-freeze storage condition and the effect of various process parameters on preimpregnated roving, was continued, and additional data are plotted on newly drawn graphs. Some of the experiments for studying the interaction of tension and roving resin content were repeated, and a more reliable graph of these results is presented. New interlaminar shear data were collected and are presented. (Author)

AD-265 308 Div. 14, 1, 26
(TIPSB/MS) OTS price $3.60

Snell, Foster D., Inc., New York.
RAIN REPELLENT.
Quarterly interim rept. no. 3, 1 July-30 Sep 61. 10 Oct 61, 33p. incl. tables.
(Contract NOw 61-0463-c)
Unclassified report

DESCRIPTORS: (*Aircraft, *Windshields, *Moistureproofing, Films, Thin films, Epoxy resins, Silicones, Silanes, Ethers, Organic solvents, Sulfuric acid, *Storage, Stability, Acceptability.) (*Aerosols, *Packaging, *Coatings, Silicon coatings, Plastic coatings, *Containers, Effectiveness.)

Formulations based on acidified silicone oils in combination with acidified dimethyldiethoxysilane suffer a loss in rain repellence on storage. The use of n-hexyl ether in combination with acidified dimethyldiethoxysilane has been found to eliminate haze in the film resulting from application of the rain repellent based on acidified dimethyldiethoxysilane alone to a heated windshield. This system shows satisfactory repellence after one month's aging at 160 F. when stored in a metal aerosol can lined with a phenolic-epoxy coating. (Author)

AD-265 319 Div. 14
(TIPSB/CW) OTS price $1.60

United States Rubber Co., Wayne, N. J.
HIGH TEMPERATURE RADIATION RESISTANT MATERIALS.
Progress rept. no. 3, 1 Feb-30 Apr 61, by C. I. Carr and R. Miller. 17 May 61, 14p. incl. illus. tables.
(Contract NObs-84025)
Unclassified report

DESCRIPTORS: Reinforcing materials, *Heat resistant polymers, Hydrocarbons, *Antioxidants, *Oxidation inhibitors, *Elastomers, *Ethylenes, *Propenes, Solvent action, Resistance, Adhesion, Air, Oxidation, Aging, Oxides, Synthetic rubber, *Butyl rubber, Carbon black.

Stress relaxation studies for EPR containing Sb203 and Hypalon 40 have been carried out. A mixture of dialkyl hydrogen phosphite and a phenol antioxidant does not protect EPR against the effects of air oxidation. The adhesion of EPR to brass and steel wire is improved with this protective system. The addition of Sb203 and Hypalon to EPR does not alter its aging characteristics in ASTM No. 1, ASTM No. 3 oil and Tricresyl phosphate. Polyethylene and EPR with low levels of carbon black, containing Sb203 and a chlorinated paraffin exhibit good green and aged electrical properties. (Author)

AD-265 354 Div. 14, 1, 12
(TIPSM/EJH) OTS price $5.60

Snell, Foster D., Inc., New York.
DEVELOPMENT OF A SPRAYABLE, STRIPPABLE, PROTECTIVE COATING FOR AIRCRAFT, MISSILES AND ROCKETS.
Quarterly rept. no. 3, 1 June-31 Aug 61, by N. Sergienko, R. W. Allan and G. R. Weissman. 15 Sep 61, 58p. incl. tables.
(Contract NOw 61-0469)
Unclassified report

DESCRIPTORS: (*Aircraft finishes, Coatings, *Plastic coatings, Films, *Organic coatings, *Resins, Synthetic rubber, Plasticizers, Plastics.) (Methyl radicals, Acrylic resins, Sheets, *Pigments, Coatings, Adhesion, Temperature, Climatic factors, Thickness.) Aircraft, Guided missiles, Rockets, Polymers, Vinyl chlorides, Tests, Test methods.

Stripability characteristics of various plasticizers and surfactants in combination with Geon Latex 652 vehicles on plexiglas and client's panels are given. Included are results obtained before and after accelerated weathering. Results are reported on the attack of various plasticizers and surfactants on specimen Navy finishes. Data are reported on heat resistance and thickening studies of various combinations of ingredients. No success has been achieved in the development of a formula which is strippable from plexiglas or from lacquered panels when applied in thin films and exposed to accelerated weathering. (Author)

AD-265 396 Div. 14, 30, 7
(TIPSM/SEB) OTS price $2.60

Battelle Memorial Inst., Columbus, Ohio.
STUDIES, INVESTIGATIONS, AND TESTS ON STANDARD AND NONSTANDARD PARTS AND MATERIALS. TASK 608. SUNPROOFING WAXES.
Final rept.,
by W. J. Yurgen, S. Palinchak, and P. B. Stickney. 31 Aug 61, 23p. incl. tables, 10 refs.
Unclassified report

DESCRIPTORS: (Tests, Test methods for *Weatherproofing, *Waxes, Rubber, Vulcanizates, Synthetic rubber, Aging.) (Electric insulation for Electric cables, Electric wire.) (Waxes, Effectiveness against Ozone.)

The ozone resistance of a number of SBR specimens containing different sunproofing waxes has been studied under various conditions in the ozone chamber and outdoor weathering. The study showed that a direct relationship exists between ozone resistance and the temperature at the time of initial exposure. The observations noted for specimens exposed outdoors during warm and cold weather correlated with accelerated ozone data at similar temperatures. On the basis of these studies, a tentative accelerated test is proposed, consisting of exposing dumbbell specimens at 20 per cent elongation under constant load at 50 to 60 F and 100 to 120 F and 50 pphm of ozone concentration for a period of 7 days. (Author)

AD-265 493 Div. 14, 4
(TIPSM/EJH) OTS price $1.60

Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N. Y.
IMPROVEMENT OF THERMAL STABILITY OF TEXTILE FIBERS.
Progress rept. no. 6, 1 Oct-31 Dec 60, by F. R. Eirich, L. A. Rajbenbach and others. 31 Dec 60, 13p.
(Contract N140(138)67904B)
Unclassified report

DESCRIPTORS: (*Nylon, *Fire resistant textiles, *Fire resistant coatings, Melting, Combustion, Inhibition.) (*Vinyl radicals, *Acetates, *Copolymerization with *Acrylonitriles.) (*Nitroso radicals, Reduction to *Amines.) (*Nylon, Copolymerization, Halogens, Chlorine compounds, *Phosphorus compounds.) Textiles, Coatings, Polymers, Polymerization, Chemical reactions, Substitution reactions, Synthesis, Hydrolysis.

Copolymerization of vinyl acetate with acrylonitrile proceeded well, and substantial amounts of vinyl acetate were introduced without damaging the meltproofing quality. The way is now open to combine or graft various flameproofing materials onto the hydroxyl groups resulting from vinyl acetate hydrolysis. The continuation of our nitrosation work has brought progress along 2 lines. Although the nitroso group itself does not seem to work too well as a free radical source, the reduction to the amine group proceeded smoothly, and another grafting spot was made onto the nylon for the anchorage of flame retarding agents. In the course of the work to attach P compounds in this manner, very interesting reactions were observed between halogen phosphorous and nylon. These P compounds appear to impart appreciable flame stabilization and have substantial crosslinking action with respect to the nylon. It appears possible to use a melt retarding agent which at the same time would be flame retarding. (Author)

AD-265 494 Div. 14, 4
(TIPSM/EJH) OTS price $1.10

Institute of Polymer Research, Polytechnic Inst. of Brooklyn, N. Y.
IMPROVEMENT OF THERMAL STABILITY OF TEXTILE FIBERS.
Progress rept. no. 7, 1 Jan-31 Mar 61, by F. R. Eirich, P. G. Assarsson and W. M. Lee. 31 Mar 61, 6p.
(Contract N140(138)67904B)
Unclassified report

DESCRIPTORS: (*Nylon, *Fire resistant textiles, *Fire resistant coatings, Melting, Combustion, Inhibition.) (*Vinyl radicals, *Acetates, *Copolymerization with *Acrylonitriles.) (*Nylon, Copolymerization, Butyl radicals, Chlorine compounds, Halogens, *Phosphorus compounds.) Textiles, Coatings, Polymers, Polymerization, Chemical reactions, Substitution reactions, Synthesis, Hydrolysis.

Crosslinking with chloromethyl phosphonic dichloride gives excellent meltproofing and at the same time should contribute to the flame resistance in view of its phosphorous component. It appears now to be a matter of elaborating suitable reaction conditions for the additional monofunctional P compound addition, in order to obtain a good product. The grafting on acrylonitrile-vinylacetate copolymers, which upon hydrolysis, accept such flame retarders as $Ti(OCl)_3$, $SbCl_3$, and urea-P mixtures. (Author)

AD-265 499 Div. 14, 8
(TIPSM/SEB) OTS price $5.60

Synthetic Mica Corp., Clifton, N. J.
DEVELOPMENT OF ULTRA HIGH TEMPERATURE DIELECTRIC MATERIALS FOR EMBEDDING AND ENCAPSULATING ELECTRONIC COMPONENTS.
Final rept., 16 May 60-16 May 61, by F. A. Barr and J. P. McCarthy. 16 May 61, 54p. incl. illus.
(Contract NObs-78714)
Unclassified report

DESCRIPTORS: (*Dielectrics as *Embedding substances for *Encapsulation, *Electronic equipment.) (*Mica, Phosphates, Particles, Physical properties, Mechanical properties, Thermodynamics, Dielectric properties, Thermal expansion, Porosity, Measurement.) (Binders, Coatings, Cements, Glass, Aluminates, Gypsum, Aluminum compounds, Boron compounds, Phosphates.) High temperature research.

Phosphate synthetic mica was investigated as a dielectric material for encapsulating and embedding electronic components for 500 C use. Physical properties of the system were determined and found to be suitable for high temperature use. Various methods of reducing porosity were investigated including dry pressing, glass coating, additives and various phosphate bonds. The use of a devitrified glass sealing cement as a coating for the phosphate synthetic mica resulted in a composite material cured below 500 C, having good physical properties with water absorption less than 1%. Commerical capacitors, transformers, and motors were encapsulated and tested. Prototype high temperature resistors were constructed and encapsulated for 500 C applications using ceramo-plastic injection molding techniques in combination with the phosphate-mica dielectric material. (Author)

15. MATHEMATICS

AD-264 701 Div. 15, 25
(TIPSP/MFA) OTS price $2.60

Harvard U., Cambridge, Mass.
THE INVERSION OF A TRANSFORM RELATED TO THE LAPLACE TRANSFORM AND TO HEAT CONDUCTION,
by David V. Widder. Sep 61, 24p.
(Contract AF 49(638)574)
(AFOSR 1122) Unclassified report

DESCRIPTORS: (Transformations (Mathematics), *Integral transforms, Differential equations, Heat, Polynomials, Conductivity, Operators (Mathematics), *Thermal conductivity.)

An integral transform is studied for which the kernel is the fundamental solution of the heat equation. An inversion is made by use of the symbolic operator cosh x square root of D (where D stands for differentiation). Another inversion of distinctly different type is also developed. (Author)

AD-264 702 Div. 15
(TIPSP/JDP) OTS price $1.60

Harvard U., Cambridge, Mass.
ON THE CONVEXITY OF THE OVALS OF LEMNISCATES,
by J. L. Walsh. Sep 61, 11p.
(Contract AF 49(638)845)
(AFOSR 794) Unclassified report

DESCRIPTORS: (*Convex sets, Functions, Theory, Conformal mapping.) (Algebra, Polynomials.)

A lemniscate is defined as a locus in the z-plane P(z) = M, where P(z) is a polynomial not identically constant and M is a constant. This locus consists of one or more Jordan curves (branches of the lemniscate), which are mutually exterior except that each one of a finite number of points may belong to several branches. Each branch is sometimes called an oval, and the question arises whether these curves are actually ovals in the sense of being convex, at least when M is sufficiently small. (Author)

AD-264 703 Div. 15
(TIPSP/JDP) OTS price $3.60

Harvard U., Cambridge, Mass.
APPROXIMATION BY BOUNDED ANALYTIC FUNCTIONS: PROBLEM BETA',
by J. L. Walsh. Sep 61, 30p. 13 refs.
(Contract AF 49(638)845)
(AFOSR 795) Unclassified report

DESCRIPTORS: (*Functions, Theory, *Complex variables.) (Polynomials, Series.)

The problem is the study of approximation to a function f(z) analytic but not bounded in a region D on a closed set E in D. Asymptotic relations concerning degree of approximation are derived. (Author)

AD-264 704 Div. 15, 25
(TIPSP/JDP) OTS price $1.60

Harvard U., Cambridge, Mass.
SERIES EXPANSIONS IN TERMS OF THE TEMPERATURE FUNCTIONS OF PORITSKY AND POWELL,
by D. V. Widder. Sep 61, 16p.
(Contract AF 49(638)574)
(AFOSR 1009) Unclassified report

DESCRIPTORS: *Thermal conductivity, Mathematical analysis, *Series, Integral transforms.)

Necessary and sufficient conditions are obtained on a solution of the heat equation (Quart. Appl. Math. 18:97-106, 1960) in order that it can be expanded in an infinite series of the total set. (Author)

AD-264 737 Div. 15
(TIPSP/JDP) OTS price $2.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland, College Park.
BOUNDS FOR EIGENVALUES OF THE STURM-LIOUVILLE PROBLEM BY FINITE DIFFERENCE METHODS,
by B. E. Hubbard. Sep 61, 27p. incl. illus. 15 refs. (Technical note no. BN-260)
(Contract AF 49(638)228; Proj. 17501)
(AFOSR-1497) Unclassified report

DESCRIPTORS: *Matrix algebra, *Differential equations, Numerical methods and procedures, *Difference equations, Inequalities.

Certain finite difference analogues are proposed for a class of Sturm-Liouville eigenvalue problems. It is shown that the eigenvalues of the related matrix problems differ from their counterparts in the Sturm-Liouville problem by zero (h squared) where h is the mesh size. The expressions in this bound are obtained explicitly in terms of the coefficients of the differential equation and their first derivatives. (Author)

AD-264 741 Div. 15, 1, 25
(TIPSP/MFA) OTS price $1.50

National Aeronautics and Space Administration, Washington, D. C.
A LINEAR THEORY FOR INFLATABLE PLATES OF ARBITRARY SHAPE,
by Harvey G. McComb, Jr. Oct 61, 55p. incl. illus. (NASA Technical note no. D-930)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-930.

DESCRIPTORS: (*Linear systems, Theory for *Pneumatic devices and Structures, Deformation, Load distribution, Deflection, Stresses, Shear stresses, Statics, Vibration.) (Equations, Differential equations, Partial differential equations, Integrals, Integral equations, Transformations (Mathematics).)

A linear small-deflection theory is developed for the elastic behavior of inflatable plates of which Airmat is an example. Included in the theory are the effects of a small linear taper in the depth of the plate. Solutions are presented for some simple problems in the lateral deflection and vibration of constant-depth rectangular inflatable plates. (Author)

AD-264 811 Div. 15
(TIPSP/MFA) OTS price $6.60

Research Triangle Inst., Durham, N. C.
ON THE ESTIMATION OF THE PROBABILITY DENSITY,

by M. R. Leadbetter and G. S. Watson. 2 Sep 61, 64p. (Technical rept. no. 3)
(Contract Nonr-342300)
Unclassified report

DESCRIPTORS: (*Probability, *Density by Statistical analysis, Sampling, Distribution theory.) (Theory, Functions, Equations, Algebra, Integral equations.)

Estimators of the form $\hat{f}_n(x) = \frac{1}{n} \sum_{i=1}^{n} \delta_n(x-x_i)$, of a probability density $f(x)$ are considered, where $x_1, \ldots, x_n$ is a sample of n observations from $f(x)$. The properties of such estimators are discussed on the basis of their mean integrated square errors, $E[\int (\hat{f}_n(x) - f(x))^2 dx]$ (M.I.S.E.), and also on the basis of various pointwise consistency criteria. The corresponding development for discrete distributions is sketched and examples are given in both continuous and discrete cases. The definitions and results are analogous to those of Parzen for the spectral density. (Author)

AD-264 830 Div. 15
(TIPSP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON CONTINUED FRACTION EXPANSIONS FOR BINOMIAL QUADRATIC SURDS,
by E. Frank. Aug 61, 18p. (MRC Technical summary rept. no. 250)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Continued fractions, *Series for *Binomials, Number theory by Numerical methods and procedures.) (Functions, Equations, Algebra.)

The relations between approximants of the regular continued fraction expansion for square root of C + L and the approximations given by an extension of Newton's formula are given. The general relationship is given between the approximants of a regular periodic continued fraction expansion for square root of C + L and the approximations given by the extended Newton's formula. These formulas are modified to the case of symmetric periodic continued fraction expansions. Rules are given that relate the approximants of mixed periodic continued fraction expansions for square root of C + L to approximations given by the extended Newton's formula. (Author)

AD-264 831 Div. 15
(TIPSP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON A FUNCTIONAL EQUATION IN FINITE DEFORMATION,
by B. R. Seth. Aug 61, 17p. (MRC Technical summary rept. no. 251)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (*Functions of *Equations on *Deformation of Metal plates into Cylindrical bodies.) (Ellipsoids of Stresses.) (Integrals, Integration, Transformations (Mathematics).)

Five new results for bending of plates into cylindrical shells are given explicitly in terms of elliptic integrals, and three are given in terms of hyperelliptic integrals of the second kind. The mapping reduces to a hyperbolic function and the elliptic and hyperbolic shapes can then be treated. Combined with previous results it is concluded that an incompressible rectangular plate can be bent into a cylindrical shell whose section is a conic by suitable forces and couples applied both to the edges and the curved surfaces. This holds good for all new shapes obtained from the functional equation. (Author)

AD-264 832 Div. 15
(TIPSP/MFA) OTS price $1.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON THE SUPPLY OF SPARES TO INSURE ADEQUATE TESTING,
by Sam C. Saunders. Aug 61, 11p. (MRC Technical summary rept. no. 253)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (Test methods, Test equipment, *Scheduling, *Probability, Statistical functions.) (Equations, Integrals, Difference equations.)

The problem of providing the minimum number of spares for one equipment which is to be tested for a given number of hours is considered. A sufficient number of breakdowns or replacements to exhaust a stock of spares with probability not greater than a specified level is determined. Note that unless a guarantee period (i.e. an initial period of life in which breakdown cannot occur) is known, it is not ever possible to provide enough spares to insure i.e. with probability zero that breakdowns and replacements will not exhaust the stock. (Author)

AD-264 833 Div. 15
(TIPSP/MFA) OTS price $2.60

Mathematics Research Center, U. of Wisconsin, Madison.
ON THE APPROXIMATE SOLUTION OF DIRICHLET-TYPE PROBLEMS WITH SINGULARITIES ON THE BOUNDARY,
by Donald Greenspan and Ralph M. Warten. Aug 61, 19p. incl. table (MRC Technical summary rept. no. 254)
(Contract DA 11-022-ORD-2059)
Unclassified report

DESCRIPTORS: (Potential theory of *Partial differential equations and *Difference equations on *Curve fitting by *Numerical analysis, Numerical methods and procedures.) (Functions, Equations, Transformations (Mathematics), Green's functions, Taylor's series.) (Computers, Mathematical computer data.) Tables.

A numerical method is presented for the solution of boundary-value problems which are associated with elliptic partial differential equations of Dirichlet-type. Two examples are considered as relatively simple illustrations of this method and the computational data are tabulated.

AD-264 846 Div. 15
(TIPSP/MFA) OTS price $1.60

Aarhus U. (Denmark).
ON THE RATE OF GROWTH OF THE PARTIAL MAXIMA OF A

SEQUENCE OF INDEPENDENT, IDENTICALLY DISTRIBUTED RANDOM VARIABLES,
by Ole Barndorff-Nielsen. 20 June 61, 17p.
(Technical scientific note no. 5)
(Contract AF 61(052)42)
(AFOSR-1339) Unclassified report

DESCRIPTORS: (*Statistical analysis, Probability, Special functions, *Measure theory.) (Equations, Functions, Statistical functions.)

A general form of the Law of the Iterated Logarithm for Maximal Order Statistics is established by means of a generalization of the convergence part of the Borel-Cantelli lemmas. (Author)

AD-264 867 Div. 15
(TIPSP/MFA) OTS price $1.10

University Coll., Cork (Eire).
ON THE ARGUMENT OF THE DERIVATIVE OF A UNIVALENT FUNCTION,
by P. J. Donohoe and P. B. Kennedy. 20 Mar 61, 8p. (Technical (Scientific) note no. 1)
(Contract AF 61(052)263)
(AFOSR-269) Unclassified report

DESCRIPTORS: Functions of Integral equations by *Harmonic analysis.

By consideration of an example due to Littlewood (On the Coefficients of Schlicht Functions, Quart. Jnl. Math. (1) 9, 14-20, 1938) it is shown that, for functions f(z) regular and univalent in $|z| < 1$, the known estimate

$$V(r,f) = \int_0^{2\pi} \left| d_\theta \arg f'(re^{i\theta}) \right| = o(1)/(1 - r)$$

(as $r \to 1$) is best-possible in the sense that $V(r,f) > A/(1 - r)$ for some function f of the class under consideration, some constant $A > 0$ and all sufficiently small $1 - r > 0$. This is an improvement on a result due to Flett (Some Remarks on Schlicht Functions and Harmonic Functions of Uniformly Sounded Variation, Quart. Jnl. Math. Oxford (2) 6, 59-72, 1955). (Author)

AD-264 920 Div. 15, 22
(TIPSP/MFA) OTS price $3.60

Boeing Scientific Research Labs., Seattle, Wash.
THE RELATION BETWEEN THE GREEN'S THEOREM APPROACH AND THE INDIRECT METHODS FOR EXTREMAL PROBLEMS OF A LINEAR TYPE,
by Angelo Miele. Sep 61, 36p. incl. illus. tables (Flight Sciences Lab. rept. no. 47; Document no. D1-82-0133)
Unclassified report

Also available from the author.

DESCRIPTORS: (*Green's functions and Calculus of variations, Special functions by *Combinatorial analysis, Complex variables, Linear systems.) (Rockets, Rocket flight, Rocket trajectories, Combustion.)

Discontinuous solutions associated with variational problems of a linear type are approached using either Green's theorem or the indirect methods of the Calculus of Variations. With one approach, the fundamental function is employed in combination with Green's theorem. Consequently, by knowing the fundamental function, it is possible to calculate the switching function and, hence, to predict the composition of the extremal arc by means of the Legendre-Clebsch condition. (Author)

AD-264 935 Div. 15
(TIPSP/MFA) OTS price $3.60

Statistical Lab., Iowa State U. of Science and Tech., Ames.
SOME FURTHER PROPERTIES OF THE METHODS OF PARALLEL TANGENTS AND CONJUGATE GRADIENTS,
by R. J. Buehler, B. V. Shah and O. Kempthorne. Sep 61, 37p. incl. table (Technical rept. no. 3)
(Contract Nonr-53005, Proj. NR-042-207)
Unclassified report

DESCRIPTORS: (Functions and Theory by Integral equations, Matrix algebra, *Polynomials, *Scheduling.)

A comparison is made between the methods of parallel tangents and steepest descent at the first point at which they do not coincide, namely P4. These results can be used to obtain an idea of the performance of the method of parallel tangents for the determination of the minimum of any unknown regression function and of the method of conjugate gradients for the numerical solution of linear systems. (Author)

AD-264 967 Div. 15
(TIPSP/MFA) OTS price $1.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
FUNCTIONS OF REVERSIBLE MARKOV PROCESSES THAT ARE MARKOVIAN,
by J. Hachigian and M. Rosenblatt. Sep 61, 17p.
(Technical rept. no. 4)
(Contract Nonr 56229, Proj. NR 042-217)
Unclassified report

DESCRIPTORS: (*Functions of *Statistical processes, Matrix algebra, *Probability, Integration, Difference equations, Measure theory, Polynomials.)

A number of results obtained by C. J. Burke and M. Rosenblatt (Ann. Math. Stat. 29:1112-1122, 1958) on conditions under which functions of Markov processes are Markovian are extended. Only finite state Markov chains were considered under the following conditions: either (a) the chain is stationary and reversible, or (b) the chain has a stationary transition mechanism with continuous time parameter and any initial distribution is allowed. In both these contexts, under appropriate conditions, if the transition probabilities of the collapsed chain satisfy the Chapman-Kolmogorov equation, the collapsed chain must be Markovian. (Author)

AD-264 997 Div. 15, 32
(TIPSB/MS) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
A NOTE ON CATEGORIAL GRAMMARS,
by Robert P. Mitchell. Aug 61, 31p. incl. table
(Rept. no. 6-90-61-21-A)
Unclassified report

DESCRIPTORS: (*Language, *Machine translation, *Mathematical analysis, *Sequences, Vocabulary, Communications theory.) (*Applied mathematics, Mathematical logic.)

This paper presents a technique for studying the structure and theory of categorial grammars. Grammars of the type studied by Y. Bar-Hillel and others are shown to be representable over a two-symbol alphabet. A trivial corollary is that the

category sentence is decidable in all these grammars. A decision problem for normal categorial grammars, of which restricted categorial grammars are an example, is shown to be recursively undecidable. A minimal (three-category) grammar is defined and properties of sequences of categories in this grammar are discussed. Some of the linguistic motivations for this study are presented. (Author)

AD-265 022 Div. 15
(TIPSP/JDP) OTS price $2.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
A VARIATIONAL METHOD FOR FUNCTIONS SCHLICHT IN AN ANNULUS,
by P. L. Duren and M. Schiffer. 11 Sep 61, 27p. (Technical rept. no. 99)
(Contract Nonr-22511, Proj. NR-041-086)
Unclassified report

DESCRIPTORS: Functions, *Conformal mapping, *Calculus of variations.

Consideration is given to the family of function f(z) regular analytic and schlicht in the annulus R and satisfying the following conditions: (1) f(z) maps R onto the unit disk minus some continuum G, and (2) G contains the origin. Extremal problems (maximum modulus on the inner boundary and maximum displacement on the outer boundary of R) are solved using a specific method of variation within the family. The variation leads from every given f(z) to a large set of comparison functions within the family. The use of the variational method is further illustrated in finding the maximum diameter of the continuum G for all functions in the family F.

AD-265 114 Div. 15
(TIPTP/WH) OTS price $1.60

New York State Coll. of Agriculture, Cornell U., Ithaca.
LEAST SQUARES ESTIMATORS OF TWO INTERSECTING LINES,
by Wallace Blischke. Sep 61, 11p. (Technical rept. no. 7; BU-135-M)
(Contract Nonr-40139)
Unclassified report

DESCRIPTORS: (*Least squares method, Statistical data, Analysis of variance, Series.)

AD-265 152 Div. 15, 26
(TIPSP/JDP) OTS price $2.60

Florida State U., Tallahassee.
OPTIMAL SCALING FOR ORDERED CATEGORIES. Technical rept. no. 2 on The Development of Statistical Methods for Quality Control and Surveillance Testing. Subjective Testing and Quality Evaluation,
by R. A. Bradley, S. K. Katti, and Irma J. Coons. Aug 61, 28p. incl. illus. tables.
(Contract Nonr-98808, Proj. NR 042-004, In cooperation with General Foods Corp.)
Unclassified report

DESCRIPTORS: (*Quality control, Statistical analysis, *Statistical tests, *Analysis of variance.) (Food, Sampling, Quality control, Statistical processes, Experimental data.)

The determination of optimal weights for points on scoring scales for subjective comparative experiments is considered. A scoring scale with a specific number of points is considered and it is assumed that verbal or other indications imply an order to the scale points. The optimal spacing for the scale points is obtained in the sense that treatment or item differences are maximized relative to error or within - treatment variation. The method is presented in sufficiently generalized form to be used directly with any experimental design leading to the analysis of variance. An iterative procedure is presented that is suitable for computer use and that yields the optimal differences among the ordered scale points. Properties of this procedure are discussed. Five examples with a five-point scale are shown for experiments on the acceptability of food samples from a food-product class. One example is discussed in detail and results for the others are shown for comparison. (Author)

AD-265 200 Div. 15
(TIPSP/JDP) OTS price $5.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A SURVEY OF FUNCTIONAL INTEGRATION WITH APPLICATIONS OF THE WIENER INTEGRAL,
by Thomas I. Seidman. 16 Oct 61, 53p. incl. illus. 51 refs. (Rept. no. 55G-1)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (*Integration, *Functional analysis, Integrals.) (Measure theory, Integration.)

A survey is presented of certain aspects of the widely varied mathematical investigations into the possibilities of integrating functionals over infinite-dimensional spaces (or, equivalently, finding expectations of functionals dependent on infinitely many independent random variables). A certain familiarity with the concepts of probability theory and the theory of measure and integration is assumed which surveys several definitions of integration over a real Hilbert space (or an extension of such) with respect to the normal distribution and some of the relevant results without proofs. A more detailed treatment is considered of some topics relating to applications of the Wiener integral. (Author)

AD-265 250 Div. 15
(TIPSP/WH) OTS price $1.60

North Carolina State Coll., Raleigh.
OSCILLATIONS OF A PENDULUM UNDER PARAMETRIC EXCITATION,
by Raimond A. Struble. Oct 61, 18p. incl. illus. (Technical memo. no. 9)
(Contract DA 36-034-ORD-2733, Proj. TB2-0001)
(AROD rept. no. 2125:17) Unclassified report

DESCRIPTORS: *Harmonic analysis, Harmonic oscillators, *Oscillation, Mathematical analysis, Motion, Differential equations, Perturbation theory, Non-linear differential equations.

The motion of a simple pendulum which is excited parametrically by vertical oscillations of its support is treated. The motion is governed by the nonlinear equation $\ddot{\theta} + (\omega_0^2 + \frac{\ddot{\xi}}{L}) \sin \theta = 0$, where dots indicate time differentiations, $\omega_0 = (g/L)^{1/2}$ is the natural frequency of small (free) oscillations of the pendulum, ξ is the displacement of the pendulum support, L is the length of the pendulum and θ is the angular displacement of the pendulum from the vertical. (Author)

AD-265 254 Div. 15
(TIPSP/JDP) OTS price $4.60

Institute of Mathematical Sciences, New York U., N. Y.
CERTAIN DUAL INTEGRAL EQUATIONS AND SONINE'S INTEGRALS,
by A. S. Peters. Aug 61, 41p. (Rept. no. IMM-NYU 285)
(Contract Nonr-28506)
Unclassified rport

DESCRIPTORS: (*Operational calculus, *Integral equations, *Integrals.) (Simultaneous equations, Bessel functions, Integral transforms.)

Consideration is given to the solution of simultaneous equations called dual integral equations. A method based on the use of Sonine's discontinuous integrals is developed. A system of dual integral equations is solved by the systematic application of Sonine's integral, and a more general formula is found. The method is then shown to be applicable for solving the more general dual equations.

AD-265 259 Div. 15
(TIPSP/WH) OTS price $8.60

Institute of Mathematical Sciences, New York U., N. Y.
SOME UNIQUENESS THEOREMS FOR THE REDUCED WAVE EQUATION,
by Leo M. Levine. June 61, 99p. 30 refs. (Research rept. no. BR-33)
(Contract AF 49(638)229, Proj. 47500)
(AFOSR-1017) Unclassified report

DESCRIPTORS: (*Wave analysis, Harmonic analysis, Bessel functions, Integral equations.) (Electromagnetic waves, *Conical bodies, *Spheres, Elasticity, Vibration, Operators (Mathematics), Integrals, *Green's function, *Partial differential equations.)

Various extensions of the Magnus-Rellich uniqueness theorem for the reduced wave equation in infinite domains are treated. The theorem is extended to cover piecewise smooth boundary surfaces of a general kind, and mixed boundary conditions; no auxiliary edge conditions are required at edges or at discontinuities in the boundary conditions - continuity of the wave function in the closure of the domain is sufficient. Another extension treats infinite boundaries; for real values of the propagation constant, these are restricted to surfaces which are (generalized) cones sufficiently far from the origin. (Author)

AD-265 309 Div. 15, 30
(TIPSP/JDP) OTS price $13.00

Sylvania Electric Products, Inc., Waltham, Mass.
NEW TECHNIQUES FOR MACHINE COMPUTATION OF THE Q-FUNCTION, TRUNCATED NORMAL DEVIATES, AND MATRIX EIGENVALUES,
by Donald E. Johansen. July 61, 184p. incl. illus. tables (Scientific rept. no. 2)
(Contract AF 19(604)7237)
(AFCRL-556) Unclassified report

DESCRIPTORS: (*Functions, *Statistical functions, Integrals, *Matrix algebra, *Digital computers, Programming, Numerical methods and procedures.) (Series, Statistical distributions, Data storage systems, Memory devices, Magnetic tape.) Antenna radiation pattern.

Three engineering memoranda are covered: (1) digital computer evaluation of the Q-function, (2) the generation of (truncated) random normal deviates, and (3) a modified Givens' method for the eigenvalue evaluation of large matrices. (Author)

AD-265 348 Div. 15
(TIPSP/JDP) OTS price $1.60

Applied Mathematics and Statistics Labs., Stanford U., Calif.
BEST POSSIBLE RATIOS OF CERTAIN MATRIX NORMS,
by Betty Jane Stone. 1 Sep 61, 12p. incl. tables (Technical rept. no. 12)
(Contract Nonr-22537, Proj. NR-044-211)
Unclassified report

DESCRIPTORS: *Matrix algebra, *Vector analysis, Theory, Functions, Real variables.

A matrix is defined as a square matrix of order n with complex elements. A vector is a column vector with n complex components. A matrix norm is a real-valued function v defined on the space of matrices and satisfying certain relations for arbitrary matrices A and B and arbitrary complex scalars c. A vector norm is a real-valued function defined on the space of vectors and satisfying relations analogous to those for a matrix norm. For an arbitrary matrix A and two arbitrary matrix norms u, v, consideration is given to V(A) when the value of U(A) is known. Conclusions are then applied to a number of familiar matrix norms. (Author)

AD-265 349 Div. 15
(TIPSP/JDP) OTS price $3.60

Syracuse U., N. Y.
METRIC ENTROPY, WIDTHS, AND SUPERPOSITIONS OF FUNCTIONS.
Technical note on Relations between Function Spaces,
by G. G. Lorentz. 1 Oct 61, 32p. 18 ref.
(Contract AF 49(638)619)
(AFOSR-1590) Unclassified report

DESCRIPTORS: (*Functional analysis, Polynomials, Trigonometry.) (*Functions, Real variables, Theory.)

An introduction is given to some recent developments connected with properties of compact sets of continuous functions. Complete proofs are not given, but their main ideas are explained. (Author)

AD-265 384 Div. 15
(TIPSP/JDP) OTS price $2.60

Columbia U., New York.
SOME CONFIDENCE BOUNDS FOR DETERMINANTAL ROOTS,
by T. W. Anderson. 31 Aug 61, 23p. (Rept. no. CU-58-61)
(Contract Nonr-26633, Proj. NR 042-034)
Unclassified report

Division 15 - MATHEMATICS

DESCRIPTORS: *Statistical analysis, *Determinants, *Matrix algebra, Analysis of variance, Transformations (Mathematics), Sampling.

Attention is focused on the case of two covariance matrices. On the basis of F-distributions, confidence bounds are derived for the roots of one population covariance matrix relative to the other which consist of multiples of the smallest and largest roots of one sample covariance matrix relative to the other. The main result is to give bounds which are the shortest among bounds consisting of multiples of the smallest and largest roots. (Author)

AD-265 393 Div. 15
(TIPSP/JDP) OTS price $1.60

Columbia U., New York.
NOTE ON A SEQUENTIAL CLASSIFICATION PROBLEM,
by Ester Samuel. 20 Oct 61, 10p. incl. illus.
(Rept. no. CU-59-61)
(Contract Nonr-26633)
Unclassified report

DESCRIPTORS: Population, Classification, *Statistical analysis, *Sequential analysis, Probability.

An explicit description is given of a minimal complete class of decision rules for the problem of sequentially classifying the individuals of a group which is known to come from one of two completely specified populations.

AD-265 441 Div. 15
(TIPSP/MFA) OTS price $1.00

Battelle Memorial Inst., Columbus, Ohio.
A DISCUSSION OF THEORIES OF GRAIN-BOUNDARY DIFFUSION.
Rept. on Interactions, Imperfections and Alloy Theory,
by C. C. Maneri and F. J. Milford. July 61, 34p. incl. illus.
(Contract AF 33(616)6265)
(ARL-48) Unclassified report

DESCRIPTORS: (Theory of *Solids, *Diffusion by Numerical analysis.) (Transformations (Mathematics), Integral transforms, Differential equations, Partial differential equations, Integration.)

The major theoretical efforts dealing with grain-boundary diffusion were reconsidered with a view to establishing their mathematical rigor and laying a firm foundation for further work. The details of Whipple's solution to the boundary value problem were reconstructed and are given. Fisher's approximate solution and its relationship to the exact solution were considered. A way of evaluating the accuracy of this approximation was outlined. The work of Borisov et al., was shown to be equivalent to that of Whipple. An outline is presented of computational problems directed toward improving our understanding of the relationship of grain-boundary diffusion to the usual model and evaluating various approximations which are frequently used in the study of grain-boundary diffusion. (Author)

16. MEDICAL SCIENCES

AD-264 724 Div. 16
(TIPSB/CCH) OTS price $12.00

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
AVERAGE RESPONSES TO CLICKS IN MAN RECORDED BY SCALP ELECTRODES.
Doctoral thesis,
by Chris Daniel Geisler. 4 Nov 60, 158p. incl. illus. table, 87 refs. (Technical rept. no. 380)
(Contract DA 36-039-sc-78108, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: (*Physiology, *Electrodes, Recording devices for Measurement and Statistical functions of Conditioned reflex in Cerebral cortex, *Brain, Head, Man, Laboratory animals, Electric potential, Stimulation.) (Experimental data, Data processing systems, Mathematical computer data, Analysis of Sensory perception.) *Theses.

Electric potentials were recorded from scalp electrodes in response to different sensory stimuli and, in particular, to clicks. These electric responses are usually too small to be detected in the electroencephalogram. With the use of an average-response computer, those components of the responses that are time-locked to the delivery of sensory stimuli can be studied. The present study deals with the characterization of average responses to acoustic-click stimuli in man. These responses were compared with evoked responses in subhuman species, and tentatively identified as secondary responses. The effects of the biological structures that separate the brain from a recording site on the scalp was investigated. The conclusion was made that the average click responses obtained from the human scalp are probably secondary cortical responses. This conclusion is based, in part, on two series of experiments: One in which the effects of multisensory stimulation were investigated, and another in which the effects of sleep upon average responses to clicks were studied. (Author)

AD-264 800 Div. 16
(TIPSB/MS) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
EFFECTS OF RADIATION EXPOSURE ON RESPONSE LATENCIES OF RHESUS MONKEYS.
by A. A. McDowell, W. Lynn Brown, and James E. Wicker. Sep 61, 4p. incl. table (Rept. no. 61-94)
(In cooperation with The University of Texas, Austin, Tex.)
Unclassified report

DESCRIPTORS: (*Primates, Laboratory animals, *Conditioned reflex, *Radiation effects, X rays, Reaction time, Dosage.)

Thirty-nine male and 25 female rhesus monkeys, ranging in age from 42 to 54 months, that had previously been exposed to varying dosages of nuclear radiations, were tested in a modified version of the WGTA for 10 trials per day over a five-day period on response latency to a familiar food-rewarded wooden block placed randomly over either of the two outside food wells. They were then tested for 10 trials per day over a five-day period on response latency to either the same food-rewarded wooden block or to a novel non-rewarded wooden block presented siumltaneously. The following results were obtained: (1) on the single-stimulus-block condition, the higher the relative radiation dosage, the longer was the response latency; and (2) when the novel nonrewarded stimulus block was introduced, the higher the relative radiation dosage, the less was the disruption of response latency. (Author)

AD-264 801 Div. 16
(TIPSB/CCH) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
EXCRETION TRENDS IN MEN UNDERGOING DEACCLIMATIZATION TO HEAT.
by Henry B. Hale, James P. Ellis, Jr. and others. July 61, 8p. incl. illus. tables (Rept. no. 61-81)
Unclassified report

DESCRIPTORS: (*Exercise and Climatic factors on Man.) (*Excretion, Volume of Urine, Urea, Uric acid, Creatinine, Metabolic products from *Heat, Temperature, Exposure, Experimental data, Statistical analysis.)

The possibility that exercise or good physical condition influences the rate at which human beings deacclimatize to heat was investigated. Twenty-one men were studied over a 10-week period during which daily peak temperatures declined from 95 to 54 F. (September to November). Two overnight (timed) urine specimens per subject per week were analyzed for Na, K, PO4, urea, uric acid, creatinine, and 17-hydroxycorticosteroids (17-OHCS). Five of the men exercised daily, 9 exercised twice each week, and 7 never exercised (exercise was defined as cross-country runs of 3 to 8 miles). Urine volume, uric acid excretion rate, the uric acid/creatinine ratio, urea excretion rate, and sodium excretion rate tended to remain at the initial (summer) level; these observations suggest that summertime adjustments are quite persistent. However, significant variation with time was found for creatinine, potassium, and 17-hydroxycorticosteriod excretion rate as well as for the urea/creatinine, phosphate/creatinine, sodium/potassium, and 17-OHCS/creatinine ratios. (Author)

AD-264 820 Div. 16, 8
(TIPSB/CCH) OTS price $1.60

Istituto Superiore di Sanita, Rome (Italy).
RESEARCH ON THE EFFECTS OF DRUGS ON THE ACTIVITY OF SPINAL CORD INTERNEURONES, REGISTERED BY MEANS OF MICROELECTRODES.
Annual summary rept.,
by Vincenzo G. Longo. 1 July 61, 6p. illus.
(Contract AF 61(052)399)
(AFOSR-1200) Unclassified report

DESCRIPTORS: (*Medical research on *Drugs, Effectiveness on *Nerves, Spinal cord.) (Methyl radicals, *Piperdines, Dosage, Laboratory animals, *Chemoreceptors of Brain by *Subminiature electronic equipment, Tests, Toxicity.) (Measurement by Electrodes, Recording devices.)

A detailed analysis of the action of 1762 IS was made. The usual pharmacological procedures

were used as well as a more specific technique which included a study of the modifications of the electrical activity at the various levels of the cerebro-spinal axis, the effects of the application to the cerebral and cerebellar cortex of the substance on the cortical electrical activity and its action on spinal integratory mechanisms. In preliminary toxicity studies, a synthetic compound, 4-formyl-4-phenyl-N-methyl-piperidine (1762 IS) showed convulsant properties very similar to those of strychnine. More detailed neuropharmacological investigations dealing with the action of 1762 IS on the cerebral electrical activity, on the mono-and polysnaptic reflexes and on the 'primary' spinal inhibition have confirmed the similarities between this compound and strychnine. Some relationships between structure and pharmacological properties are discussed. (Author)

AD-264 892 Div. 16
(TIPSB/LH) OTS price $2.60

Mount Sinai Hospital, New York.
RELATION OF HEPATIC INJURY TO HEPATIC FIBROSIS.
Progress rept., 16 Oct 60-15 Sep 61,
by Hans Popper, Tibor Barka and others.
15 Sep 61, 22p. 28 refs.
(Contract DA 49-007-md-790)
Unclassified report

DESCRIPTORS: *Liver, *Injuries, Pathology, Hepatitis, Fibers, Cells (Biology), Bile, Schistosomiasis.

Various types of acute hepatic injury and of processes leading to and associated with hepatic fibrosis and cirrhosis were studied by fine structural and biochemical techniques. In subacute ethionine intoxication of the rat and in human viral hepatitis, the emphasis was laid on alterations of the endoplasmic reticulum. In cholestasis alterations of billary microvilli were followed by changes in other cytoplasmic organelles. In giant cell hepatitis of infancy, excess acid phosphatase distribution is conspicuous while in Wilson's disease a lysosomal alteration had been demonstrated. Hepatic steatosis in acute ethionine intoxication was associated with impairment of the catecholamine metabolism. The hepatic mesenchymal cells in part developing in response to liver injury were subdivided on a functional basis. Proliferation of bile ductules were found associated instead of with biliary obstruction with hydrocholeresis suggesting that these cells secrete an electrolyte rich fluid. Steroid therapy influences the florid but not the later stationary phase of subacute ethionine intoxication. A constant relation between hepatic hydroxyproline and DNA in various conditions with hepatic fibrosis suggests a role of cell proliferation in fiber formation. (Author)

AD-264 899 Div. 16
(TIPSB/LH) OTS price $1.10

Washington U., Seattle. School of Medicine.
EXPERIMENTAL CONCUSSION.
Final rept.,
by Arthur A. Ward, Jr. 1961, 2p.
(Contract Nonr-94200, Proj. NR 101 127)
Unclassified report

DESCRIPTORS: (*Head, *Injuries, Physiology, Therapy, Atropine.)

AD-264 911 Div. 16
(TIPSB/LH) OTS price $1.60

Polytechnic Inst. of Brooklyn, N. Y.
MECHANISM OF ENZYME ACTION.
Semi-annual rept. no. 5, 1 Jan-30 June 61,
by C. G. Overberger, Bernhard Kosters, and Norman Vorchheimer. 30 June 61, 18p. incl. illus. table.
(Contract DA 18-108-405-cml-302)
Unclassified report

DESCRIPTORS: (*Enzymes, Vinyl radicals, Benzimidazoles, Synthesis, Polymers, Hydrolysis, Catalysis, *Azoles, Chemical reactions.)

The successful synthesis of 5(or 6)-vinyl benzimidazole is described. This monomer was prepared via a route which started with beta-(4-formanilino)-ethyl formate. The final step was dehydrochlorination of 5(or 6)-(beta-chloroethyl)-benzimidazole. Structure of the monomer was proven by elemental analysis, derivatives, hydrogenation and ozonolysis. Attempts to prepare copolymers of 4-vinyl imidazole and allyl alcohol by reduction of the methyl acrylate copolymers are described. Also reported are attempts to prepare 1-methyl-4 (or 5)-vinyl imidazole and copolymers of 4-vinyl imidazole and vinylene carbonate. The successful synthesis of copolymers with acrylic acid and of poly(4-vinyl imidazole) are reported. Some kinetic studies of the hydrolysis of p-nitrophenyl acetate catalyzed by imidazole-containing polymers are reported. All polymers tested were slower than imidazole itself. It is concluded that no enhancement of catalytic activity was found in the few polymers tested. The synthesis of new polymers is in progress. (Author)

AD-264 932 Div. 16, 2, 9
(TIPSB/CCH) OTS price $2.60

Human Engineering Lab., Aberdeen Proving Ground, Md.
THE PROPAGATION OF AIR SHOCK WAVES ON A BIOPHYSICAL MODEL,
by John J. Romba and Paul Martin. Sep 61, 26p. incl. illus. tables (Technical memo. no. 17-61)
(Proj. 5B9520001)
Unclassified report

DESCRIPTORS: (Propagation of Air, *Shock waves in Model tests, Biophysics.) (Physiology of *Detonation waves on Laboratory animals, Head, Brain.) (Measurement, Experimental data, Wave characteristics, Wave transmission in Tissue (Biology).)

Shock wave characteristics were studied in the field about and within the Rhesus monkey body form. Measurements were obtained in free air, top of the animal's head, the mid-brain and the lower thorax; with distance and position of the explosive varied in relation to the animal's body. The study of shock wave transmission from one body level to another was accomplished and the problem complexity of shock wave energy distribution in the field of the organism was emphasized. Shock wave forms were observed to be uniquely characteristic of the medium through which shock wave transmission occurred. In addition, body tissue was found to greatly attenuate the shock wave. The study of shock wave characteristics in and about biophysical media is believed to be relatively unexplored. (Author)

AD-264 937 Div. 16, 6
(TIPSE/CCD) OTS price $.75

Indiana U., Bloomington.
A STUDY CONCERNING THE ACCOMMODATION AND CONVERGENCE RELATIONSHIP.
Rept. for 1 Feb 58-1 Apr 61, on Physiology Research,
by Merrill J. Allen. May 61, 22p. incl. illus.
(Contract AF 33(616)6146, Proj. 7163)
(ASD TR 61-111) Unclassified report

DESCRIPTORS: (*Eye, Optometry, *Infrared optical systems, Electronic systems, Recording devices, Visual perception, Physiology, Reaction time, Stability, Sensitivity, Human engineering, Stimulation.) (*Haploscopes, Optical instruments, Recording devices, Dioptometers, Photomultipliers, Design, *Medical equipment.)

The design and technical details of a recording infrared optometer and haploscope are reported. Electronic circuitry, optical design and mechanical design are described. The infrared optometer has proven superior in performance to any known similar apparatus in stability, linearity, speed of response, sensitivity, ease of alignment, and freedom from noise. It is built into a haploscope of unique fixed-mirror design developed for this study. The subject's head is fixed with a dental bite support and his pupil is dilated. Accommodation is recorded as the output of the infrared photomultiplier system while convergence is recorded as the position of the haploscope convergence arm. Both accommodation and convergence are fed into an X-Y recorder. Accommodation is also fed into a strip recorder to obtain measures of accommodation speed, reaction time, and stability. (Author)

AD-265 077 Div. 16
(TIPSB/CW) OTS price $1.10

Robert B. Brigham Hospital, Boston, Mass.
PHYSIOPATHOLOGY OF NON-FREEZING COLD INJURY.
Progress rept. 1 Oct 60-1 Oct 61,
by J. Peter Kulka. 1 Oct 61, 8p. 10 refs.
(Contract DA 49-193-md-2007)
Unclassified report

DESCRIPTORS: (*Exposure, *Injuries, Pathology, Tissues (Biology), Control.) (Adrenal cortical extract, Serotonin, Butazolidines, Chloroquine, *Vasomotor drugs, Pharmacology.)

Studies have demonstrated that the irreversible tissue damage in non-freezing cold injury of the mouse ear is a consequence of progressive venular and capillary stasis. This microcirculatory disorder appears to be the resultant of venular dilation in the presence of arteriolar constriction leading to excessively sluggish venular flow and leakage of plasma from the dilated venules causing hemoconcentration, increased viscous resistance to flow, and ultimately intravascular impaction of erythrocytes. Somewhat milder, but qualitatively similar changes were produced in the ears of weanling rats under the same conditions of cold exposure. Further investigations were aimed at the factors which control or mediate this pathogenetic chain reaction. Cortisone in high daily parenteral dosage was found to inhibit the onset of stasis and necrosis for 5-9 days of cold exposure. This prophylactic action of cortisone was associated with an inhibition of venular dilation and endothelial leakage, providing additional evidence that these two factors are decisive in the development of microcirculatory insufficiency. In preliminary experiments with phenylbutazone, oxphenbutazone and chloroquine, little or no prophylactic or therapeutic benefits were noted. (Author)

AD-265 110 Div. 16
(TIPSB/CW) OTS price $1.60

California U., Los Angeles. School of Medicine.
METHYLENEDIOXY-AMPHETAMINE HALLUCINOGENIC SERIES OF COMPOUND (I). CONDITIONED BEHAVIOR AND ELECTROENCEPHALOGRAPHIC TEST METHODS (II).
Final progress rept., 1 Apr-30 Sep 61,
by Gordon A. Alles and M. David Fairchild.
Oct 61, 12p. illus.
(Contract DA 18-108-405-cml-735)
Unclassified report

DESCRIPTORS: (*Conditioned reflex, Production, *Mescaline, Dosage.) (*Brain, Physiology, Eletric potential, Electroencephalography.) Laboratory animals, Pharmacology. *Hallucinogens.

Approximately 10 grams of each of the salts of four 3,4-Methylenedioxy-amphetamine derivatives were submitted for further testing in animals and possible evaluation of their relative hallucinogenic activities in man. No organized report as to work progress on these compounds is yet available. The behavioral studies involving avoidance-escape training in Swiss Albino mice has been completed. All six test compounds have been injected into at least five mice in at least two dose levels. The effect of the drugs on the extinction of the conditioned response in relationship to a control group receiving isotonic saline is presented. Work on the EEG test methods during this past six months has consisted largely of the construction of an eight channel frequency analyzer. Details of this instrument are presented in the body of this report. (Author)

AD-265 226 Div. 16, 20
(TIPSB/CW) OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
PANCREATIC ISLET CELL TUMORS AND RENAL TUMORS IN THE MALE RAT FOLLOWING NEUTRON EXPOSURE,
by V. J. Rosen, T. J. Castanera and others.
27 Sep 61, 22p. incl. tables (Rept. no. NRDL-TR-529)
Unclassified report

DESCRIPTORS: (*Neutrons, *Radiation effects, Laboratory animals.) (*Tumors, Production in Pancreas and Kidneys.)

During a study of the long term and late effects of fast neutron exposure in the rat a large number of primary pancreatic and renal neoplasms was observed at autopsy. The incidence of pancreatic islet cell tumors among non-irradiated control animals was 17% whereas the same tumor was found in 56% of the animals exposed to 230 rads and 44% of those exposed to 320 rads. The functional significance, if any, of these tumors has not been established. Most of the animals with islet cell tumors also had primary tumors in one or more of the other endocrine tissues although no specific pattern of concomitant tumors was discernible. Renal neoplasms, in

the form of adenomas, carcinomas and transitional cell carcinomas, were found in 41% of the animals exposed to 230 rads and in 43% of those exposed to 320 rads. No renal neoplasia was observed in the non-irradiated controls derived from the same litters. This finding suggests that renal neoplasia in these rats is a response to radiation rather than an event in the normal aging process. On a rad dose basis neutrons are more potent than x-rays for the induction of both islet cell and renal parenchymal tumors. (Author)

AD-265 227 Div. 16
(TIPSB/MS) OTS price $3.60

Lankenau Hospital Research Inst., Philadelphia, Pa.
EFFECTS OF DIETARY PROTEIN ON PERFORMANCE CAPACITY OF MAN AND DOG IN A COLD ENVIRONMENT.
Rept. no. 1 (Final), 1 Feb 59-31 Jan 61,
by K. Rodahl, S. M. Horvath and others.
31 Jan 61, 33p. incl. illus. tables, 11 refs.
(Contract DA 19-129-qm-1304)
Unclassified report

DESCRIPTORS: (*Diet, *Proteins, *Metabolism, Stress (Physiology), Exposure, Climatic factors, Arctic regions, Tests.)

The effect of four different diets (Diet A: 3000 Calories, 70 g protein; Diet B: 3000 Cal, 4 g protein; Diet C: 1500 Cal, 70 g protein; Diet D: 1500 Cal, 4 g protein) on physical performance capacity was studied in normal young men at an ambient temperature of 22 C and the effects of two diets (A and D) were studied at 8 C. At room temperature of 22 C there was no significant difference between the four diets with respect to their capacity, as judged by the treadmill test. At an ambient temperature of 8 C no significant deterioration in physical performance capacity was observed in nude subjects living on a 3000 Cal, 74 g protein diet for 10 days. There was, however, a marked deterioration in physical performance capacity in nude subjects living on a diet deficient in calories and proteins (1500 Cal, 4 g protein) at an ambient temperature of 8 C for 4-5 days. (Author)

AD-265 261 Div. 16
(TIPSB/CW) OTS price $4.60

Naval Radiological Defense Lab., San Francisco, Calif.
FATTY ACID METABOLISM IN RAT INTESTINAL SEGMENTS,
by D. Porte and C. Entenman. 21 Sep 61, 42p. incl. illus. tables (Research and development technical rept. no. NRDL-TR-526)
Unclassified report

DESCRIPTORS: *Fatty acids, *Metabolism, Oxidation, Intestine.

An in vitro preparation of rat intestinal segments capable of incorporating, esterifying, and oxidizing fatty acids is presented. After appropriate selection of tissue segments, reproducibility is excellent. With this preparation, three separate reactions have been studied; esterification, oxidation, and incorporation of fatty acid. Esterification required glucose and oxygen but was insensitive to insulin. Succinate did not substitute for glucose. Oxidation and esterification were depressed by succinate, fluoride, and arsenate. Oxidation was not influenced by glucose. Incorporation followed the kinetics of a first order reaction at any albumin concentration. It was also found to be a reversible reaction, independent of cellular energy production. The implications of the reversible nature of the reaction have been discussed with reference to a reinterpretation of the source of plasma FFA. Sodium taurocholate in high concentration accelerated incorporation, but not esterification, as has been previously reported. (Author)

AD-265 262 Div. 16
(TIPSB/CW) OTS price $1.10

School of Aerospace Medicine, Brooks Air Force Base, Tex.
TOLERANCE TO ANOXIA AND THE DEVELOPMENT OF CEREBRAL SUCCINIC DEHYDROGENASE AND CYTOCHROME OXIDASE ACTIVITIES IN THE RABBIT.
by S. Cassin and C. S. Herron, Jr. Sep 61, 5p. 18 refs. (Rept. no. 61-111)
(In cooperation with Florida U. Coll. of Medicine, Gainesville)
Unclassified report

DESCRIPTORS: (*Anoxia, Resistance.) (*Cerebral cortex, *Dehydrogenases, *Cytochrome oxidase, Biochemistry.) Laboratory animals.

Cerebral succinic dehydrogenase and cytochrome oxidase activities were measured in rabbits varying in age from less than 24 hours to adulthood. The activities of both enzymes are quite low at birth, but gradually increase to adult levels 15 to 18 days postnatally. The time at which adult levels of enzyme activity are reached coincides with the critical period of growth as described by Schade and Baxter (Exp. Neurol. 2:158, 1960) and Flexner. (Enzymatic and functional patterns of the developing mammalian brain. In Waelsch, H. (ed.) Biochemistry of the developing nervous system, p. 281. New York: Academic Press, 1955.) The critical period for development of the oxidative enzymes studied coincides with the time at which the developing rabbit becomes least resistant to anoxia. (Author)

AD-265 277 Div. 16
(TIPSB/CW) OTS price $1.60

Pennsylvania U., Philadelphia.
A STUDY OF METHODS OF EQUILIBRATING TISSUE OXYGEN REQUIREMENTS AND TISSUE OXYGEN SUPPLY IN SHOCK AND SHOCK-LIKE STATES.
Annual progress rept., 31 July 60-31 July 61,
by Harry M. Vars. 31 July 61, 17p.
(Contract DA 49-007-md-511)
Unclassified report

DESCRIPTORS: (*Traumatic shock, Production by Aorta, Obturation.) (*Hypotension, Blood circulation, Hemorrhage, Blood transfusions, Corticosteroids, Epinephrine, Secretion.) (*Tissues (Biology), *Oxygen consumption.)

The secretion (microgram/min) and peripheral blood concentration of epinephrine (E), norepinephrine (N), 17-hydroxycorticosteroids (17-OHCS) and adrenal vein blood flow were measured in hemorrhagic shock: (1) bled to 60 mm Hg, maintained for 1 hr, then bled to 30 mm Hg and maintained for 1 hr; and (2) bled directly to 30 mm Hg, and maintained for 2 hr. In other experiments peripheral blood levels of E and N were followed during hypotension at 30, 45 and 60 mm Hg, maintained for 1.5, 2, 3, 4 and 6 hr.

The adrenal response to shed blood replacement was also observed. With varying degrees and duration of hypotension a prompt increase in E, followed by a lesser and more variable increase in N, occurred in all groups. Blood reinfusion resulted in a sharp decrease to somewhat above control values of E and N when high secretion and blood levels were obtained at the time of transfusion. The adrenal vein blood 17-OHCS concentration usually increased at moderate levels of hypotension (60 mm Hg) although the microgram/min secretion may have decreased due to the reduction in blood flow. When the blood pressure was reduced to 30 mm Hg adrenal blood flow and corticoid secretion were markedly reduced to much lower levels. (Author)

AD-265 279 Div. 16, 20
(TIPSB/LH) OTS price $3.00

Physics, Engineering, Chemistry Corp., Boulder, Colo.
BIOMEDICAL EFFECTS OF EXPOSURE TO ELECTROMAGNETIC RADIATION. PART II - BIOMEDICAL EFFECTS ON THE EYE FROM EXPOSURE TO MICROWAVES AND IONIZING RADIATIONS.
Rept. for Jan-Dec 60 on Physiology Research, by Archibald R. Buchanan, Harold C. Heim, and Jack J. Kraushaar. June 61, 158p. incl. illus.
(Contract AF 33(616)6305, Proj. 7163)
(ASD TR 61-195) Unclassified report

DESCRIPTORS: (*Electromagnetic waves, Microwaves, Ionization, *Radiation effects.) (Eye, Retina, *Radiation injuries, Skin, Muscles, Tumors, Nerves.) (Absorption, Dosage, Biochemistry.) (X rays, Gamma rays, Beta particles, Cosmic rays, Neutrons.)

A search of the literature has revealed that ionizing radiations produce deleterious ocular effects, the most prominent being the development of cataracts. Retinal damage has also been reported. The threshold dose for ocular damage has not been definitely established but a single large dose of radiation seems more harmful to the lens than an equivalent amount of small radiation doses. A considerable number of studies have been devoted to the effects of ionizing radiation upon biochemical processes of the eye. The effects of X-rays have been studied in some detail, but almost no information exists on the effects of neutrons, protons, mesons, microwaves, and ultrasonic radiation. Much more effort must be expended on dose measurements and their interpretation before a full understanding of the problem of the effects of radiation on the eye can be achieved. Experimenters should express their results in terms of energy absorbed by the ocular tissue so there will be a basis for deriving the RBE. (Author)

AD-265 323 Div. 16, 14
(TIPSB/CW) OTS price $1.60

Tennessee U., Knoxville.
BIOLOGIC RESPONSE TO POLYURETHANE FOAM.
Progress rept. for 31 Oct 60-31 Oct 61, by R. T. Sherman. 31 Oct 61, 19p. incl. illus. tables.
(Contract DA 49-193-md-2099)
Unclassified report

DESCRIPTORS: (*Expanded plastics, *Urethanes, Polymers, Selection and Preparation for *Surgery, *Transplantation in Abdomen, Biochemistry, Pathology, Toxicity.) Laboratory animals.

Contribution of useful information for selection, preparation, and use of macromolecular polymers in human surgery as well as intensive study of mobilization, metabolic routes, excretion, storage, and possible toxic effects to the host of long term implants of polyurethane, a popular implant polymer is the basis of this project. Fifty, 100, and 200 gram amounts of powdered Teflon have produced no mortality 488 days following intraperitoneal implants in dogs. Only one dog (50 grams) with similar amounts of powdered polyurethane in the peritoneal cavity has survived longer than 185 days post implant. Reversal of A/G ratio without significant total protein change is present in all survivors. Toxicity studies in rats, mice, and dogs of prepolymer and catalyst necessary for polymerization of polyurethane foams indicate very high dosages are necessary to produce death in these animals. Details of experimental design and results to date of a C14 tracer study of implanted polyurethane are reported. Results indicate an excellent possibility of application of these methods to definitive study of polymer implants in general. Observation for carcinogenic effect of subcutaneous and tibial implants of polyurethane rigid foam reveal no tumors to date (316 days after insertion). (Author)

AD-265 355 Div. 16
(TIPSB/MS) OTS price $1.60

Springfield Coll., Mass.
ELECTROGONIOMETRIC STUDY OF LOCOMOTION AND OF SOME ATHLETIC MOVEMENTS,
by Philip D. Gollnick and Peter V. Karpovich.
27 Sep 61, 18p. incl. illus. tables.
(Contract DA 49-007-md-889)
Unclassified report

DESCRIPTORS: (*Body, *Joints (Physiology), *Legs, *Arms, Motion, Measurement.) (*Anthropometry, Instrumentation.)

The present report deals with the analysis of the action of the knee and ankle joints during walking on the treadmill with various angles of inclination. An attempt was also made to analyze the action of the same joints during running, somersaulting, and swimming. The action of the elbow joint was also studied in pitching a baseball, in shot putting, and in swimming. (Author)

AD-265 366 Div. 16, 15
(TIPSB/CW) OTS price $4.60

Yale U., New Haven, Conn.
WHAT DO PHYSICAL FITNESS TESTS MEASURE. A REVIEW OF FACTOR ANALYTIC STUDIES.
Technical rept. no. 1 on The Development of Criteria of Physical Proficiency, by Delmer C. Nicks and Edwin A. Fleishman.
July 60, 39p. incl. illus. 85 refs.
(Contract Nonr-60932)
Unclassified report

DESCRIPTORS: (*Physical fitness, Measurement, Tests, *Factor analysis.)

This review describes fourteen factors of physical proficiency identified from previous research. Other possible factors which might be discovered were also described. A number of questions were raised regarding the structure of skill in this area and suggestions were made for future studies to answer these questions.

Several things are clear. There is no such thing as general physical proficiency. The problem is a multidimensional one. It is also clear that previous studies comparing American youth with youth of other countries have assessed only a small number of the factors already identified. Eventually the development of a battery of basic reference tests which will provide comprehensive coverage of abilities in this area is anticipated. Such measures would also allow an assessment of the relative contributions of the component abilities to a variety of different, more complex, athletic performances. An outline and description of tests which might be included in such studies is presented. Some are well known tests but others are new ideas. This outline also provides an interim report of what abilities such tests probably measure. (Author)

AD-265 367 Div. 16, 15
(TIPSB/CW) OTS price $3.60

Yale U., New Haven, Conn.
THE DIMENSIONS OF PHYSICAL FITNESS. A FACTOR ANALYSIS OF SPEED, FLEXIBILITY, BALANCE, AND COORDINATION TESTS.
Technical rept. no. 3 on The Development of Criteria of Physical Proficiency,
by Edwin A. Fleishman, Paul Thomas, and Philip Munroe. Sep 61, 29p. incl. illus. tables.
(Contract Nonr-60932)
Unclassified report

DESCRIPTORS: *Physical fitness, Measurement, Tests, *Factor analysis.

Six factors were identified to account for performance on the thirty performance tests. Originally, nine factors were hypothesized, and the possibility of still additional factors was allowed. This finding is important in its own right since it provides for a simpler way of describing performance in these areas of physical proficiency: Explosive Strength, Extent Flexibility, Dynamic Flexibility, Gross Body Equilibrium, Balance-Visual Cues, and Speed of Limb Movement. (Author)

AD-265 392 Div. 16, 25
(TIPSB/CCH) OTS price $.50

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
EFFECTS OF HIGH INTENSITY SOUND ON CIRCULATION OF THE INNER EAR OF THE GUINEA PIG.
Rept. on Acoustic Energy Control,
by Farrel R. Robinson and James P. Cleary.
May 61, 5p. incl. illus.
(Proj. no. 7231)
(ASD TN 61-58) Unclassified report

DESCRIPTORS: (High frequency, *Sound, Stimulation, Blood vessels, Circulatory system, *Ear, Laboratory animals, Physiology.) *Stress (Physiology), Biophysics.

The blood vessels of the spiral ligament of the cochlea of the guinea pig were observed during intense sound stimulation. No characteristic reproducible change in the physiology of these vessels was seen during sound stresses of 140 db for as long as 30 minutes. (Author)

AD-265 408 Div. 16, 32
(TIPSB/CW) OTS price $3.60

Fordham U., New York.
SELECTED ABSTRACTS FROM SOVIET BIOMEDICAL JOURNALS NO. 7,
by Robert Pollitzer. Sep 61, 40p. incl. tables, 47 refs.
(Contract DA 18-108-405-cml-867)
Unclassified report

DESCRIPTORS: (*Medicine, *Preventive medicine, *Communicable diseases, Epidemiology, Disease carriers, *Immunology, *USSR, *Bibliography, Abstracting.)

AD-265 470 Div. 16, 28
(TIPSB/MS) OTS price $3.00

Human Engineering Lab., Aberdeen Proving Ground, Md.
HANDBOOK OF COLOR NOTATION SYSTEMS,
by Charles Fried and Richard S. Gibson. Sep 61, 177p. incl. tables (Technical memo. no. 10-61)
(Proj. TB1-1000)
Unclassified report

DESCRIPTORS: (*Colors, Classification, Handbooks.)

This handbook provides the CIE Chromaticity Coordinates for five systems of designating colors. The five systems are the Munsell, Ostwald, Textile Color Card Association, and U.S. Army Color Card, Federal Specification TT-C-595, and Commercial Standard CS 1947-47. A sixth system, the Inter-Society Color Council - National Bureau of Standards color name blocks, is included along with equivalent Munsell renotations. In addition, a single table has been compiled of the five systems for which CIE coordinates have been determined, in terms of ascending values of the chromaticity coordinates, to aid in cross referencing between systems. This handbook will provide a means to specify exactly colors which have been designated in the past in terms of samples or chips in color notation systems. (Author)

AD-265 486 Div. 16, 14, 4
(TIPSB/CCH) OTS price $.50

Industrial Biology Research and Testing Labs., Inc., Philadelphia, Pa.
CUTANEOUS TOXICITY EVALUATION OF AIR FORCE DEVELOPMENT MATERIALS - IV,
by Morris V. Shelanski and Karl L. Gabriel.
Apr 61, 8p.
(Contract AF 33(616)6962, Proj. 7165)
(ASD Technical rept. 61-77)
Unclassified report

DESCRIPTORS: (*Sensitivity, *Toxicity, Tests of *Skin, Man, Laboratory animals.) (Materials, *Chemicals, *Lubricants.) (Handling, Safety, Aviation personnel.)

Twelve Air Force development materials were studied via the prophetic patch test method on laboratory animals and volunteer human subjects to determine the primary irritant effect and the sensitization index of these materials. These materials were also studied by the Shelanski repeated insult patch test method on human volunteers to determine the primary irritation effect, fatiguing effect, and sensitization index. The patch test studies with rabbits indicated that only one material, Alkyldecalin, was too severe a primary irritant to test on humans. Upon testing the remaining materials on humans, Diethylcyclohexane was found to be a severe primary irritant. All other materials were found to be safe to use in contact with the human skin. (Author)

AD-265 495 Div. 16
(TIPSB/CW) OTS price $1.10

Polytechnic Inst. of Brooklyn, N. Y.
MECHANISM OF ENZYME ACTION.
Terminal rept., 1 Jan 59-31 Aug 61,
by C. G. Overberger, Norman Vorchheimer, and Thomas St. Pierre. 26 Oct 61, 5p.
(Contract DA 18-108-405-cml-302)
Unclassified report

DESCRIPTORS: (*Proteases, *Chymotrypsin, Chemical reactions, Synthesis.)

The research herein described has been an investigation of the mechanism of catalysis of proteolytic enzymes in general, and of alpha-chymotrypsin specifically. This was undertaken both by degradative studies of alpha-chymotrypsin itself and by the synthesis and kinetic investigation of possible model systems, both polymeric and of low molecular weight. An interesting effect recently discovered was the increase of catalytic rate constant (or catalytic activity) with increasing amount of imidazole in the polymers, independent of imidazole-group concentration in the solution, and no matter what the other groups in the polymer. Explanations for this phenomenon are being sought. The synthesis of imidazole-containing monomers, polymers, and low molecular weight model compounds, and the kinetic investigation of these species as catalysts, in the search for model systems of the proteolytic enzymes and the mechanisms of their action, continue. (Author)

17. METALLURGY

AD-264 731 Div. 17, 25, 4
(TIPSM/TCG) OTS price $2.60

Materials Research Lab., U. of Calif., Berkeley.
HEAT CAPACITY OF A LIQUID INDIUM-TIN ALLOY,
by Raymond L. Orr, Henri J. Giraud, and Ralph Hultgren. 1 Oct 61, 20p. incl. illus. tables, 14 refs. (Technical rept. no. 3; Series no. 155, Issue no. 3)
(Contract Nonr-22263)
Unclassified report

DESCRIPTORS: (*Indium alloys, *Tin alloys, Indium, Tin, Liquids, Specific heat, Measurement, Determination, Tests, Thermodynamics, Theory.) (Calorimeters with *Molybdenum, *Crucibles, Design, Tests.) (Additives, Platinum, Molybdenum, Liquids, Heat from Temperature, Specific heat, Measurement.) (Cooling, Eutectics, Phase studies.)

The heat capacity of a liquid In-Sn alloy containing 47.22 at.-% Sn was measured from 394 to 758 K as a function of temperature in an isothermal calorimeter. The decrease in measured Cp values became smaller with increasing temperature resembling the behavior shown by pure liquid metals. The magnitude of the decrease in Cp above the eutectic temperature of the alloy was greater than those previously found for the pure liquid components. Above the melting temperature of Sn, the alloy Cp data are compared with values calculated from Kopp's Law using previously reported pure-liquid component data. Within the over-all accuracy of the data, delta Cp = 0 for the formation of the liquid alloy from the liquid elements at temperatures where it can be evaluated. These results indicated that the liquid alloy approaches closely the properties of an ideal solution and suggest the absence of strong unlike atom interactions. Assuming delta Cp = 0 for the liquid alloy at temperatures below the mp of Sn, Cp values for both supercooled liquid In and Sn were calculated. The Cp curves obtained join smoothly with those for the liquid metals above their melting temperatures. (Author)

AD-264 744 Div. 17
(TIPSM/BRW) OTS price $2.60

Watertown Arsenal Labs., Mass.
LOW TEMPERATURE HARDNESS AND FLOW STRESS RELATIONSHIPS OF METALS.
Rept. on Research of Materials for High Temperature Use,
by John Nunes and Frank R. Larson. Oct 61, 21p. incl. illus. tables, 15 refs. (Technical rept. no. WAL TR 834.2/5)
Unclassified report

DESCRIPTORS: (*Metals, Low temperature research, Temperature, *Hardness, Plastic flow, Stresses, Theory, Mathematical analysis.) (Steel, Aluminum alloys, Copper, Iron, Titanium, Hardness, Deformation, Stresses, Tensile properties, Tests on Mathematical prediction.)

An empirical relationship between hardness and flow stress at low temperature is formulated, based upon Tabor's analysis (The Hardness of Metals, Oxford University Press, Amen House, London, 1951) of the Vickers hardness test and the authors' work on flow stresses in the tension test. As this relationship appears to be in agreement with recent dislocation theory, it may also be considered a better first approximation than previously proposed hardness and flow stress temperature dependent functions. Tests were conducted on several alloy steels, Cu, Al, Fe, and Ti, over a range of test temperatures from 200 to -196 C. (Author)

AD-264 780 Div. 17, 26
(TIPSM/BRW) OTS price $1.10

Reactive Metals, Inc., Niles, Ohio.
THE MANUFACTURE OF Ti-7Al-12Zr SHEETS.
Bi-monthly rept. no. 12, 30 June-31 Aug 61,
by J. K. Dietzel and S. R. Seagle. Sep 61, 4p. incl. table.
(Contract NOa(s) 59-6229-c)
Unclassified report

DESCRIPTORS: (*Sheets, Heat resistant alloys, Manufacturing methods, *Titanium alloys, Aluminum alloys, Zirconium alloys, Manufacturing methods, Processing, Cleaning, Pickling, Heat treatment.) (Tensile properties, Creep, Microstructure, Surface properties, Contamination, Tests.)

Bend tests were carried out by pickling 0-0.008 in. from the surface to determine the amount of removal necessary before and after air annealing at 1450 to 1800 F. The results of these tests showed that although there was essentially no contamination picked up as a result of vacuum annealing, 0.004 to 0.006 in. had to be removed after air annealing. Creep tests were conducted on 0.040 in. sheet heat treated at 1450 to 1800 F for 20 min. The results of tensile tests

showed that the greater annealed ductility (16.3%) resulted from heat treating at 1600 F, while the greatest exposed ductility (15.25%) occurred after heat treating at 1550 F. Metallographic studies revealed that recrystallization was occurring at annealing temperatures up to at least 1450 F. Above this temperature, grain growth was evident. Creep tests showed that 0.040 sheet exhibited its best creep strength when annealed above 1550 F, and its best ductility after creep when annealed at 1550 to 1600 F; 1575 was selected as the most satisfactory annealing temperature. (Author)

AD-264 794 Div. 17, 4
(TIPSM/EJH) OTS price $3.50

Research Chemicals, Inc., Burbank, Calif.
THE TECHNOLOGY OF SCANDIUM, YTTRIUM, AND THE RARE EARTH METALS. A LITERATURE SURVEY.
Rept. for Oct 59-Oct 60, on Metallic Materials, by Bernard Love. Apr 61, 229p. incl. illus. tables, 939 refs.
(Contract AF 33(616)6829, Proj. 7351)
(WADD TR 60-864) Unclassified report

DESCRIPTORS: (*Rare earth elements, Scandium, Yttrium, *Rare earth compounds, *Rare earths, Geology, Ores, Processing, Chemical properties, Physical properties, Electrical properties, Magnetic properties, Ferromagnetism.) (Mechanical properties, *Alloys of *Rare earth elements or *Rare earths, *Cerium alloys, *Gadolinium alloys, *Lanthanum compounds, *Praseodymium compounds, *Ytterbium compounds, *Yttrium compounds, Phase studies.) *Bibliography.

A survey has been made of the unclassified literature relating to the rare earth elements. The best available data has been compiled for the abundance and distribution of the elements, the methods of recovery from ores, separation and purification techniques, and procedures for reduction to metal. The physical, chemical, and mechanical properties of the elements and their important compounds are presented. (Author)

AD-264 815 Div. 17, 26
(TIPSM/BRW) OTS price $7.60

Titanium Metals Corp. of America, Toronto, Ohio.
TITANIUM SHEET ROLLING PROGRAM FOR Ti-8Al-1Mo-1V, Ti-5Al-5Sn-5Zr, AND Ti-7Al-12Zr.
Bimonthly rept. no. 11, 1 Mar-30 Apr 61, by D. L. Day, D. R. Mitchell, and H. D. Kessler. 31 Aug 61, 69p. incl. illus. tables.
(Contract NOa(s) 59-6227-c)
Unclassified report

DESCRIPTORS: (*Sheets, *Titanium alloys, Processing by Rolling mills and Heat treatment on Welding, Mechanical properties, Tensile properties, Creep, Stability.) (*Titanium alloys, Aluminum alloys, Molybdenum alloys, Vanadium alloys.) (*Titanium alloys, Aluminum alloys, Tin alloys, Zirconium alloys.) (*Titanium alloys, Aluminum alloys, Zirconium alloys.) (Low temperature research, Tensile properties, Impact shock, Welded joints, Crystal structure.) (Sheets, Surface properties, Contamination, Heat treatment, Pickling.)

A laboratory evaluation of duplex annealed Ti-8Al-1Mo-1V sheet showed that 1850 F (5 min) and air cooled (AC) + 1100 F (8 hr) provided an optimum combination of room-and elevated-temperature tensile, sub-zero temperature notch tensile, and creep properties. Contamination was found to extend to a depth of 0.002-0.0025 in., which is entirely commensurate with finish grinding and/or pickling procedures being used. A more extended study of the effect of finish annealing temperature on the creep-stability properties of Ti-5Al-5Sn-5Zr and Ti-7Al-12Zr sheets resulted in the selection of 1650 F (1/2 hr) AC as the optimum final annealing cycle for both alloys. Preliminary evaluation of welded Ti-5Al-5Sn-5Zr and Ti-7Al-12Zr showed that good as-welded and welded-and-annealed properties can be achieved. Other laboratory investigations in progress include H studies and a more thorough evaluation of various elevated-and sub-zero temperature properties. (Author)

AD-264 825 Div. 17, 25
(TIPSM/BRW) OTS price $2.00

Metals and Ceramics Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
ELEVATED TEMPERATURE DYNAMIC ELASTIC MODULI OF VARIOUS METALLIC MATERIALS.
Rept. for Aug 59-July 60, on Metallic Materials, by W. H. Hill and K. D. Shimmin. Mar 61, 75p. incl. illus. tables, 32 refs.
(Proj. no. 7351)
(WADD TR 60-438) Unclassified report

DESCRIPTORS: (Mechanics, Dynamics, Statics, *Elasticity, High temperature research, Temperature, Determination by Acoustics, Resonance on *Alloys, *Metals.) (Aluminum, Beryllium, Molybdenum, Nickel, Tungsten, Vanadium.) (Aluminum alloys, Beryllium alloys, Cobalt alloys, Copper alloys, Molybdenum alloys, Nickel alloys, Niobium alloys, Steel, Titanium alloys.) Mechanical properties, Physical properties.

The dynamic elastic moduli of 40 metals and alloys of engineering interest have been determined at room and elevated temperatures. Modulus determinations were based upon a relation between the speed of sound in a material and its elastic modulus. A specimen of the material was excited electrostatically and its resonant frequency determined. Knowing the geometry of the specimen, the dynamic elastic modulus was calculated. Room temperature comparisons of dynamic with static moduli were made in most instances using material from the same bar. The results of dynamic elastic modulus determinations are graphically presented. (Author)

AD-264 841 Div. 17
(TIPSM/EJH) OTS price $3.60

Virginia Inst. for Scientific Research, Richmond
THE ACCELERATED CORROSION OF METALS.
Quarterly rept. no. 8, 16 June-15 Sep 61, by Henry Leidheiser, Jr. and David A. Jackson, Jr. 26 Sep 61, 37p. incl. illus. tables.
(Contract DA 18-108-405-cml-518)
Unclassified report

DESCRIPTORS: (*Metals, *Aluminum, *Corrosion, *Oxidation in Air by Mercury compounds, Iodides, Humidity.) (*Corrosion research, Test methods, Test equipment, Microscopy.)

Linear rate of oxidation of Al in presence of HgI2 studied from 36.4 to 100% oxidation at 30.0 C. Slopes of oxidation rate curves increased greatly with increased relative humidity. Greatest slope increase noted in 60-80% RH range. Maximum oxidation rate 0.675 mg O2/sq cm/ min at 100% RH. (Author)

AD-264 858 Div. 17, 25
(TIPSM/REB) OTS price $1.00

Metals and Ceramics Lab., Wright Air Development Div., Wright-Patterson Air Force Base, Ohio.
THE EFFECTS OF STRAIN RATE AND HYDROGEN CONTENT ON THE LOW TEMPERATURE DEFORMATION BEHAVIOR OF COLUMBIUM.
Rept. for Dec 59-Dec 60 on Metallic Materials, by B. A. Wilcox, A. W. Brisbane, and R. F. Klinger. May 61, 28p. incl. illus. tables, 40 refs.
(Proj. 7351)
(WADD TR 61-44) Unclassified report

DESCRIPTORS: (*Refractory materials, Metals, Niobium, *Deformation, Low temperature research, Chemical impurities, Stresses.) (Hydrogen, Hydrogen embrittlement, Aging, Stresses, Tensile properties, Mechanical properties, Temperature, Fracture (Mechanics), Transition temperature.)

The strain rate and temperature dependencies of the low temperature deformation behavior of fine grained arc-melted Nb (1 ppm H) were evaluated for tensile strain rates of 0.005, 0.10 and 6.0 sq. in./min. The effect of H content (1, 9, and 30 ppm H) on the mechanical behavior was also investigated in the temperature range 25 to -195 C, using a tensile strain rate of 0.005/min. The existence of an H-dislocation interaction in Nb was confirmed by: (1) calculation of an apparent activation energy for the early stages of low temperature deformation; (2) observation of an H-induced strain aging peak at -50 C, for Nb containing 30 ppm H: and (3) observation of a serrated stress-strain curve at 25 C in coarse grained Nb containing 89 ppm H. (Author)

AD-264 983 Div. 17
(TIPSB/CCH) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF COLUMBIUM AND TANTALUM,
by E. S. Bartlett and F. F. Schmidt. 10 Oct 61, 4p. 10 refs. (DMIC Memorandum 130)
Unclassified report

DESCRIPTORS: (*Niobium alloys, *Tantalum alloys, *Tantalum, *Niobium, Mechanical properties, *Tensile properties, Temperature, Atmosphere, Measurement, Experimental data, Production, Quality control, Manufacturing methods.) Metals, *Industrial research, *Scientific research, High temperature research, Refractory materials.

AD-264 984 Div. 17
(TIPSB/CCH) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE TECHNOLOGY OF HIGH-STRENGTH STAINLESS STEELS,
by D. A. Roberts. 13 Oct 61, 3p. (DMIC Memorandum 131)
Unclassified report

DESCRIPTORS: (*Stainless steel, Mechanical properties, Tensile properties, Measurement, Tables.)

AD-264 988 Div. 17, 25
(TIPSM/BRW) OTS price $1.60

Electro-Optical Systems, Inc., Pasadena, Calif.
INVESTIGATION OF THE EFFECT OF ULTRA RAPID QUENCHING ON METALLIC SYSTEMS, INCLUDING BERYLLIUM ALLOYS.
Progress rept. no. 2, 1 June-30 Sep 61, by C. B. Jordan. 15 Oct 61, 13p. (EOS rept. 1650-4M-2)
(Contract AF 33(616)8011, Proj. 1(8-7351))
Unclassified report

DESCRIPTORS: (*Beryllium, *Beryllium alloys, Phase studies, Phase transitions, Microstructure, X-ray diffraction analysis, Lattices.) (Beryllium with Oxygen, Aluminum, Copper, Nickel, Scandium, Silicon, Zinc, Melting, Cooling.) (Beryllium compounds, Oxides, Intermetallic compounds, Nickel compounds, Copper compounds.) (Beryllium alloys, Aluminum alloys.) (Beryllium alloys, Copper alloys.) (Beryllium alloys, Nickel alloys.) (Beryllium alloys, Silicon alloys.) (Beryllium alloys, Zinc alloys.)

Progress is reported of an investigation of the effect of ultra-rapid quenching on certain alloys of Be. The experimental techniques previously developed were applied with only minor modifications to alloys of the systems Be-O, Be-Al, Be-Si, Be-Sc, Be-Ni, Be-Cu, and Be-Zn. No changes in phase appear to have been induced by ultra-rapid quenching in most of the alloys tested, although a shift of lattice parameter has been observed in several. Definite phase changes appear to have been induced in one Be-Cu alloy and in two Be-Ni alloys, but these result are subject to further confirmation. (Author)

AD-265 030 Div. 17
(TIPSM/EET) OTS price $4.60

Watertown Arsenal Labs., Mass.
THE EFFECT OF VARYING HOMOGENIZATION ON PROPERTIES AND STRUCTURE OF CAST HIGH-STRENGTH LOW-ALLOY STEEL.
Rept. on Super High-Strength Steel for Ordnance Components,
by Arthur M. Ayvazian. Aug 61, 39p. incl. illus. tables, 16 refs. (Technical rept. no. WAL TR 320.4/2)
Unclassified report

DESCRIPTORS: (High temperature research, Steel, *Steel castings, *Heat treatment, Time, Temperature, Hardening, Mechanical properties, Tensile properties, Microstructure.) (Tensile properties, Deformation, Time, Temperature, Mathematical prediction.)

An investigation was conducted to study the effect of homogenizing cast 4340 steel specimens at temperatures of 2100, 2200 and 2300 F for varying times. Subsequent to homogenization, the specimens were hardened and tempered to strength levels of 250,000 - 300,000 psi and then subjected to metallurgical examinations. The mechanical properties obtained were compared with those of specimens not homogenized and based on these results, the homogenizing temperatures and times were evaluated. Plotting ductility and toughness properties against a time-temperature parameter, T (C + log t), indicated the possibility of a trend existing with increasing homogenizing temperatures and times. Employing a linear regression analysis, a trend was established as being highly probable and possibly linear, if certain interfering variables are controlled. (Author)

AD-265 044 Div. 17
(TIPSM/BRW) OTS price $1.10

Alloyd Corp., Cambridge, Mass.
RESEARCH ON THE PRODUCTION OF ULTRA-PURE

MOLYBDENUM.
Progress rept. no. 4, 3 May-3 July 61.
3 July 61, 4p. tables.

(Contract NOw 61-0242-c)
Unclassified report

DESCRIPTORS: (Production, *Molybdenum, Purification, Molybdenum compounds, Chlorides, Reduction, Zone melting, Sublimation.)

Results are tabulated of experiments to study (1) reduction parameters for MoCl5, (2) sublimation treatments, and (3) spot checks of chemical analyses.

AD-265 129 Div. 17
(TIPSM/BRW) OTS price $1.60

Climax Molybdenum Co. of Michigan, Detroit.
INVESTIGATION OF MOLYBDENUM- AND TUNGSTEN-BASE ALLOY SHEET MATERIALS.
Quarterly rept. no. 1, 24 May-24 Aug 61,
by Gordon D. McArdle, Robert Q. Barr, and M. Semchyshen. 17p. incl. illus. tables.
(Contract NOw 61-0581-d)
Unclassified report

DESCRIPTORS: (Sheets, Refractory materials, *Molybdenum alloys, *Tungsten alloys, Processing, Melting, Electric arcs, Vacuum furnaces, Casting, Machining, Nondestructive testing, Extrusion, Rolling mills.) (Tungsten alloys, Niobium alloys.) (Molybdenum alloys, Niobium alloys.) (Molybdenum alloys, Titanium alloys, Zirconium alloys.) (Molybdenum alloys, Tungsten alloys, Zirconium alloys.) Chemical analysis, Microstructure.

Six vacuum-arc-cast, Mo- and W-base alloys were prepared. The selection of compositions for this program was based on promising alloys studied in the past in the form of rolled bar stock. Five of the alloys have been extruded to rectangular sheet bars. Additional extrusion, as well as the rolling of existing extruded bars, will be carried out. (Author)

AD-265 135 Div. 17
(TIPSM/BRW) OTS price $.50

Defense Metals Information Center, Columbus, Ohio.
REVIEW OF RECENT DEVELOPMENTS IN THE METALLURGY OF HIGH-STRENGTH STEELS,
by H. J. Hucek and A. R. Elsea. 20 Oct 61, 4p.
(DMIC memo. no. 132)
Unclassified report

DESCRIPTORS: (*Steel, Tool steel, Silicon alloys, Austenite, Heat treatment, Cooling, Mechanical properties, Tensile properties, Impact shock, Tests.)

The report summarizes recent developments in the metallurgy of high-strength steels. An interesting report has come out on the subject of austempering. Since a large number of conflicting claims have been circulated regarding this process, the results of this investigation are presented. The steel used was LaBelle Silicon No. 2 tool steel, which is an AISI Type S-5 teel. It would appear that in certain respects, austempering of this particular steel produces somewhat better properties at the 220,000-psi yield-strength level. The benefits are not evident at the higher strength level used in the investigation. (Author)

AD-265 145 Div. 17, 22, 26
(TIPSM/REB) OTS price $1.60

Kaiser Aluminum and Chemical Corp., Spokane, Wash.
STUDY IN WELDING HIGH STRENGTH ALUMINUM ALLOYS, AND STUDY OF EFFECT OF ALLOY COMPOSITIONS AND TEMPER AS WELL AS INGOT QUALITY AND PLATE QUALITY ON THE WELDABILITY, MECHANICAL AND BALLISTIC PROPERTIES OF MEDIUM AND HIGH STRENGTH ALUMINUM BASE ARMOR.
Final summary rept.,
by J. B. Hess. 17 Oct 61, 18p. 14 refs. (Rept. no. MS PR 61-62)
(Contract DA 04-200-507-ORD-333)
Unclassified report

DESCRIPTORS: (*Welding, *Aluminum alloys, Armor plate, *Armor, Welded joints, Mechanical properties, Quality control, Terminal ballistics, Welds, Tests.)

Contents:
History of the project
Development of welding techniques for high-strength Al alloys
Evaluation of 5086 and 5083 alloys as candidate armor materials
Evaluation of 5083-H115, MR19, MR20, and 6066-T6 blloys
Effect of weld quality on ballistic performance of 5083 alloy weldments
Additional attempts to develop Al armor with improved ballistic characteristics
Effect of ingot quality and plate quality on ballistic performance of 5083-H115 armor plate

AD-265 177 Div. 17, 25
(TIPSM/BRW) OTS price $5.60

Illinois U. Engineering Experiment Station, Urbana.
INELASTIC DESIGN OF LOAD CARRYING MEMBERS. PART V. THEORETICAL AND EXPERIMENTAL CREEP ANALYSES OF BEAM-COLUMNS.
Final rept., 1 Oct 60-31 Sep 61,
by D. L. Dewhirst and O. M. Sidebottom. Sep 61, 51p. incl. illus. tables, 39 refs. (T&AM rept. no. 201)
(Contract AF 33(616)7600; Proj. 7351)
Unclassified report

DESCRIPTORS: (*Beams, Design, Theory, Load distribution, Creep, Deflection, Deformation, Stresses, Moments, Mathematical prediction, Mathematical analysis, Digital computers, Programming.) (High temperature research, Tests, Beams, *Stainless steel, Preparation, Machining, Heat treatment, Dispersion hardening, Creep, Deformation, Failure (Mechanics), Buckling.)

A theory is presented for constructing load-creep deflection curves for beam-columns at any specified time. The stress-strain-time relation for the material is assumed to be represented by an isochronous stress-strain diagram approximated by an arc hyperbolic sine curve. A program has been written for the IBM 650 digital computer to calculate points on moment-curvature curves for a general I-section. The theory uses these curves and the successive approximations procedure by Newmark (Proc. Am. Soc. Civil Engrs., 68:691-718, 1942). The experimental part of the investigation included tests of rectangular- and T-section beam-columns made of 17-7Ph stainless steel and tested at 972 F.

Several slenderness ratios were considered. The beam-columns were subjected to a constant axial load located either at the centroid of the section or at an eccentricity of 15% of its depth and to a constant transverse load at midspan of sufficient magnitude to produce a linear elastic bending stress when acting alone of 0.50. (Author)

AD-265 182 Div. 17, 25
(TIPSB/CCH) OTS price $1.10

Johns Hopkins U., Baltimore, Md.
CONTINUOUS GROWTH OF SINGLE CRYSTAL ALUMINUM WIRES FROM THE MELT,
by Robert E. Green, Jr. and Norman L. Newbern.
Sep 61, 8p. illus.
(Contract DA 36-034-509-ORD-3377)
Unclassified report

DESCRIPTORS: (Growth of *Single crystals (Metallurgy) of Aluminum wire.) (Test methods, Preparation, *Zone melting.)

A vertical floating zone technique substituting a buoyant liquid for the lower support of the specimen has been developed which permits continuous growth of single crystal aluminum wires from the melt. This technique also permits the growth of single crystal aluminum wires from the same melt which possess the same crystallographic orientation but vary in diameter. (Author)

AD-265 196 Div. 17
(TIPSM/EET) OTS price $1.60

New England Materials Lab., Inc., Medford, Mass.
HARD PARTICLE STRENGTHENING OF REFRACTORY METALS FOR HIGH TEMPERATURE USE THROUGH INTERNAL OXIDATION.
Progress rept. no. 3, 1 May-30 June 61,
by A. S. Bufferd, K. M. Zwilsky and N. J. Grant.
31 July 61, 13p. incl. illus.
(Contract NOw 61-0316-c)
Unclassified report

DESCRIPTORS: (*Refractory materials, *Heat resistant alloys, *Dispersion hardening, *Molybdenum alloys, Titanium alloys by Titanium, Oxidation, Particles, Titanium compounds, Dioxides.) (Powder alloys, Oxygen, Diffusion, Sintering.) (Molybdenum alloys, Castings, Extrusion by Explosive forming, Crystallization, Transition temperature, Microstructure, Stresses, Rupture, Grains (Metallurgy).)

The recrystallization temperature of 2 internally oxidized Mo-1.5 Ti alloys was determined. The alloy extruded with the lower reduction ratio of 4 to 1 had a recrystallization temperature of 2650 F, whereas the alloy extruded with a 6 to 1 ratio recrystallized at about 2400 F. Stress-rupture tests in Ar at 2200 F of 3 internally oxidized alloys recrystallized during Dynapak extrusion gave lower properties than were obtained for stress-relieved arc cast Mo-1.5 Ti. (Author)

AD-265 212 Div. 17, 4
(TIPSP/MFA) OTS price $2.60

Illinois U., Urbana.
DIFFUSION OF GASES IN HAFNIUM,
by E. Bisogni and C. Wert. 2 Aug 61, 14p. incl. illus.
(Contract AF 49(638)672)
(AFOSR-1226) Unclassified report

DESCRIPTORS: (Metallic crystals, Crystal structure, Metals, Alloys, Lattices, *Gases in *Hafnium, Atoms, *Diffusion, Friction, Martensite.) (Laboratory equipment, Experimental data, Vacuum apparatus, Damping, Vacuum furnaces, Thermocouples, Torsion bars, Coils.) (Chemical impurities, Oxygen, Nitrogen, Hydrogen, Carbon.)

This study shows that damping effects may be a general attribute of hcp alloys and demonstrates that similar peaks appear in alloys of Hf. From this study a number of interesting characteristics of the diffusion of oxygen in the alloys is deduced. A description of the laboratory procedure is included. (Author)

AD-265 326 Div. 17
(TIPSM/EET) OTS price $1.60

Westinghouse Electric Corp., Pittsburgh, Pa.
RESEARCH AND DEVELOPMENT IN HIGH STRENGTH HEAT RESISTANT ALLOYS.
Interim rept. no. 14, 27 Aug-26 Oct 60,
by A. L. Feild, Jr., 26 Oct 60, 8p. incl. tables.
(Contract NOa(s) 58-852-c)
Unclassified report

DESCRIPTORS: (*Heat resistant alloys, *Tantalum alloys, *Tungsten alloys, Chromium alloys, Hafnium alloys, Vanadium alloys, Rhenium alloys, Melting, Electric arcs, Electrodes, Alternating current, Direct current.) Tantalum, Tungsten. (Machining, Cutting tools, Carbide tools.) Grinders, Abrasives, Silicon compounds, Carbides. (Sheet, Rolling mills.) (Casting, Molding materials, Copper.) (Hardness, Measurement.)

The scale-up of several Ta and W base alloys to a 2-in.-diam ingo size by arc melting was accomplished. A 2500 ampere A-C power supply has been installed for consumable electrode melting of W-base materials and extensive arc furnace modifications have been made. A comparison is included between A-C and D-C melting for primary consolidation of Ta and W alloys. Studies are underway to determine the best methods for machining, grinding and cutting W and Ta alloy shapes which must be conditioned. A technique of intermediate screening of promising alloys is now being utilized. This consists of producing arc-cast sheet bar shapes in a button melting furnace for subsequent direct conversion to strip by hot rolling. Some hot-hardness data have been obtained at 2000 F on several Ta base alloys. (Author)

AD-265 364 Div. 17
(TIPSP/JDP) OTS price $3.60

Wah Chang Corp., Albany, Oreg.
REDUCTION AND CONSOLIDATION OF SUPERIOR QUALITY MOLYBDENUM ALLOYS.
Interim rept. 1 Mar-30 Apr 61,
by Edmund Baroch, D. S. Fairgrieve, and James Wong. 30 Apr 61, 30p. incl. illus. tables (Rept. no. WCA 1001-5)
(Contract NOa(s) 60-6046-c)
Unclassified report

DESCRIPTORS: (*Molybdenum alloys, Reduction, Processing, Single crystals.) (*Molybdenum alloys, Calcium, Oxides, *Intermetallic compounds, Melting, Electron beams, Sintered alloys.) (Sheets, Molybdenum, Processing, Single crystals, Crystallization.) (Molybdenum, Sheets, Production, Powder alloys, Crystallization.)

The problem encountered in electron-beam melting of molybdenum, particularly that containing calcium and calcium oxide, has been largely overcome by improvements made both in the starting material and in the design of the electron-beam furnace and gun. Starting material was vacuum sintered to remove a large portion of the volatile material. The use of a remote gun, accelerating anode, and focusing coils permitted melting of the sintered material at reasonable rates. Molybdenum sheet rolled from a single crystal was found to have a recrystallization temperature between 1400 and 1600 F. The as-rolled sheet exhibited low room temperature ductility. However, following a one hour anneal at 1400 F, the ductility was significantly improved. Molybdenum sheet was produced by powder metallurgy techniques using inert handling and vacuum sintering. Considerable ductility was obtained in the longitudinal and transverse directions from 0.048-in. sheet. Recrystallization temperature of this material is approximately 2200 F. (Author)

AD-265 387 Div. 17, 26
(TIPSM/BRW) OTS price $4.60

Fansteel Metallurgical Corp., North Chicago, Ill.
TUNGSTEN SHEET ROLLING PROGRAM.
Interim rept. no. 6, 1 May-30 June 61,
by George C. Bodine, Jr. 24 July 61, 41p. incl. illus. tables.
(Contract NOw 60-0621-c)
Unclassified report

DESCRIPTORS: (Rolling mills, *Sheets, *Tungsten, Manufacturing methods, Processing, Production.) (*Powder metals, Powder metallurgy, Additives, Thorium compounds, Oxides, Aluminum, Hydrostatic pressure, Sintering, Hydrogen, Mechanical properties, Physical properties, Chemical properties.) (Sheets, Metal plates, Heat treatment, Tensile properties, Hardness, Microstructure, Welding, Deformation.)

Additional tensile and bend data were obtained from material processed in the powder evaluation phase. Billets for sheet process evaluation were isostatically pressed from undoped, 1% thoria, and Al-doped powder. Undoped pressed billets were H sintered and processed through operations designed to permit evaluation of the effect of heating and pass reduction upon the properties of plate and sheet. (Author)

AD-265 418 Div. 17
(TIPSM/BRW) OTS price $.50

Naval Research Lab., Washington, D. C.
PROTECTION OF REFRACTORY METALS FOR HIGH TEMPERATURE SERVICE.
Final quarterly progress rept. no. 4, 1 Apr 61 on The Zinc-Base Coating for Niobium.
by B. F. Brown, R. A. Meussner and others.
16 Aug 61, 16p. incl. illus. tables (NRL Rept. no. 5643)
Unclassified report

DESCRIPTORS: (*Refractory materials, Zinc coatings for *Niobium, *Niobium compounds, *Zinc compounds, Phase studies, Vapor pressure, Measurement, Purification.) (Niobium, *Zinc coatings by Vapor plating, Deposits, Thickness, Life expectancy, Metallurgical analysis, Additives, Nickel alloys, Aluminum alloys, Manganese alloys.)

The vapor pressure of each of the niobium-zinc compounds was measured as a function of temperature. The kinetics of formation of the niobium-zinc compounds on pure niobium from zinc vapor were investigated, and oxidation tests were made on several coatings applied with zinc vapor. The mechanisms involved and the kinetics of the removal of interstitial impurities from niobium by the niobium-zinc compounds were also studied. Further studies of the effects of alloying elements added to the zinc bath used to coat niobium by the dip process confirmed that small amounts of nickel and aluminum in the proper combination are beneficial. (Author)

AD-265 482 Div. 17
(TIPSM/EET) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF STRAIN RATE ON MECHANICAL PROPERTIES OF WROUGHT SINTERED TUNGSTEN AT TEMPERATURES ABOVE 2500 F,
by Paul F. Sikora and Robert W. Hall. Oct 61, 24p. incl. illus. tables (Technical note D-1094)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-1094.

DESCRIPTORS: (*High temperature research, *Tungsten, Stresses, Tensile properties, Deformation, Fracture (Mechanics), Microstructure, Tests.) (Refractory materials, Tungsten, Crystallization, Heat treatment, Mechanical properties, Deformation, Velocity.) Airframes.

Specimens of wrought sintered commercially pure W were made from 1/8-in. swaged rods. All the specimens were recrystallized at 4050 F for 1 hr prior to testing at temperatures from 2500 to 4000 F at various strain rates from 0.002 to 20 in. per in. per minute. Results showed that, at a constant temperature, increasing the strain rate increased the ultimate tensile strength significantly. The effects of both strain rate and temperature on the ultimate tensile strength of W may be correlated by the linear parameter method of Manson and Haferd and may be used to predict the ultimate tensile strength at higher temperatures, 4500 and 5000 F. As previously reported, ductility, as measured by reduction of area in a tensile test, decreases with increasing temperature above about 3000 F. Increasing the strain rate at temperatures above 3000 F increases the ductility. Fractures are generally transgranular at the higher strain rates and intergranular at the lower strain rates. (Author)

AD-265 483 Div. 17
(TIPSM/EET) OTS price $.75

National Aeronautics and Space Administration, Washington, D. C.
EFFECT OF INERT, REDUCING, AND OXIDIZING ATMOSPHERES ON FRICTION AND WEAR OF METALS TO 1000 DEGREES F,
by Donald H. Buckley and Robert L. Johnson. Oct 61, 26p. incl. illus. table, 15 refs. (NASA Technical note D-1103)
Unclassified report

DESCRIPTORS: (High temperature research, Surfaces, *Metals, Alloys, *Friction, *Erosion, Controlled atmospheres.) (Surfaces, Oxides, Films, Lubricants.) (Air, Nitrogen, Argon, Oxygen, Hydrogen.) (Bearings, Materials,

Space environmental conditions.) (Heat resistant alloys, Steel, Stainless steel, Copper, Cobalt alloys, Cermets, Titanium compounds, Niobium compounds, Carbides, Nickel.) Test equipment, Rotating structures, Sliding contacts, Disks.

Friction and wear characteristics were studied for various bearing metals in inert, reducing, and oxygen controlled atmospheres at temperatures to 1000 F. A hemispherically tipped rider (3/16-in. rad.) under a 1000-g load slid on a rotating disk at a surface speed of 35 fpm. The absence of oxides on metal surfaces resulted in excessive wear and high friction of metals. In some instances where surfaces were devoid of oxides (electrolytically pure Cu), mass welding of the specimens occurred. The presence of extremely small quantities of O (in the atmosphere) for some metals (0.03 vol-% O2 for 440-C stainless steel) was found to be sufficient to provide adequate surface protection of the metal by oxide. (Author)

18. MILITARY SCIENCES AND OPERATIONS

AD-264 705 Div. 18, 1, 12
(TIPSB/MS) OTS price $1.10

Hycon Mfg. Co., Pasadena, Calif.
SPACE POWER. A SPEECH BY TREVOR GARDNER CHAIRMAN OF THE BOARD AND PRESIDENT HYCON MFG. COMPANY, MONROVIA, CALIFORNIA BEFORE THE AIR FORCE SCIENCE AND ENGINEERING SYMPOSIUM SAN FRANCISCO, CALIFORNIA.
3 Oct 61, 30p.
Unclassified report

DESCRIPTORS: (*National defense, Astronautics, USSR, Countermeasures.)

AD-264 783 Div. 18, 12
(TIPSW/DLW) OTS price $2.60

RAND Corp., Santa Monica, Calif.
OPTIMAL TIMING IN MISSILE LAUNCHING: A GAME-THEORETIC ANALYSIS,
by Melvin Dresher and Selmer Johnson. 1 Mar 61, 28p. incl. illus. (Rept. no. RM-2723)
(Contract AF 49(638)700, Proj. RAND)
Unclassified report

DESCRIPTORS: (*Guided missiles, Surface to surface, *Launching, *Launching sites, Vulnerability, Military operations, Scheduling, Reliability, Mathematical analysis, Games theory.)

Suppose that Blue plans to launch a missile during some specified time interval. Prior to a launching, Blue must expose the missile for a time period, during which the missile is vulnerable to attack and may be destroyed by Red. Prior to its exposure, Blue's missile is assumed to be underground, where it may be pinned down for a time interval or possibly destroyed by a Red missile. The optimal time is formulated for Blue to launch his missile, and the optimal time is analyzed for Red to attack Blue. This scheduling problem is formulated and analyzed as a two-person game. Various game models are considered in which the three types of vulnerability are introduced as stochastic elements. The optimal strategies, i.e., the optimal launching times, are described. (Author)

AD-265 056 Div. 18
(TIPSB/JAB) OTS price $10.50

American U., Washington, D. C.
A SELECTED BIBLIOGRAPHY ON UNCONVENTIONAL WARFARE. PART I,
by Hope Miller, William A. Lybrand and others.
Oct 61, 137p.
(Sponsored by the Dept. of the Army)
Unclassified report

DESCRIPTORS: (*Warfare, *Bibliography, Military operations, Military organizations, Military training, Selection, Logistics, Guerrilla warfare.) (USSR, Europe, China, Asia.)

Unconventional warfare by United States Joint Chiefs of Staff and Army definition consists of the three interrelated fields of guerrilla warfare, evasion-and-escape, and subversion. Part I of this bibliography (the present volume) encompasses these three fields; Part II (to be published later) will cover unclassified sources in the field variously labeled counterguerrilla warfare, counterinsurgency warfare, or operations against irregular forces. Inasmuch as the 400-odd entries in this volume were selected from over 1,800 entries in the SORO information storage system, the bibliography is not comprehensive. Rather, it presents a cross section of available literature on the various unconventional warfare subjects included. Because entries were selected to provide this cross sectional view, users of the volume can feel confident, after reading all of the sources referenced under any subject, that they have been exposed to a fairly complete picture of the understanding of the subject as it exists in the unclassified literature. It is anticipated that later SORO bibliographies of classified sources will complete the picture for qualified users with respect to important aspects of unconventional warfare activities which, primarily because they are clandestine in nature, tend to be written about only in classified documents. (Author)

AD-265 132 Div. 18, 22, 26
(TIPSM/CCH) OTS price $2.60

Duke U., Durham, N. C.
PHYSICAL INVENTORY ACCOUNTING PROGRAM,
by Marion R. Bryson and Robert E. Cutting.
31 July 61, 16p. incl. tables (Technical rept. no. 9)
(Contract DA 31-124-ORD-10-3)
Unclassified report

DESCRIPTORS: (*Sampling, Supplies, *Logistics, Army, Ordnance, *Military budgets, Records.) Tests, Errors, Statistical analysis.

AD-265 373 Div. 18
(TIPSB/CDW) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
TRACKING OF MISSILES AND SPACE VEHICLES REVIEW OF SOVIET LITERATURE.
Monthly rept. no. 14, Sep 61,
29 Sep 61, 9p. incl. illus. (AID rept. no. 61-140)
Unclassified report

DESCRIPTORS: (*Air intelligence, *Guided missiles, *Rockets, *Spaceships, *Tracking, *Bibliography.) (*Radio astronomy, Ionosphere, Electromagnetic waves, Electron beams, Atmospherics.) *USSR.

This report reviews Soviet developments in tracking missiles and space vehicles. It is based on source materials received at the Air Information Division during September 1961. Information not directly related to the assigned subject has been included because of its broad implications for study in this field. The materials in this report deal with the following topics: (1) Electromagnetic problems; (2) Ion clouds and ionosphere perturbations; and (3) Radio astronomy. (Author)

AD-265 436 Div. 18, 8, 32
(TIPSB/CW) OTS price $8.10

Science and Tech. Section, Air Information Div., Washington, D. C.
SPECIALIZED ELECTRONICS BIBLIOGRAPHY.
12 Sep 61, 85p. 559 refs. (AID Rept. 61-132)
Unclassified report

DESCRIPTORS: (*Bibliography, *Electronics, *USSR.)

This bibliography describes Soviet publications dealing with fields of electronics relevant to specific informational requirements. The content of the bibliography is based entirely on USSR monographs, periodicals, monographs in series, and other open sources available at the Air Information Division. Within each heading and subheading entries are arranged alphabetically by author. Titles of Soviet monographs are rendered in the transliterated form, followed by the English translation. Annotations are provided where clarification is considered necessary. Library of Congress call numbers are included at the end of the entries when the source is available in the collections of the Library of Congress. (Author)

AD-265 451 Div. 18, 32
(TIPSB/MS) OTS price $21.00

American Geographical Society, New York.
PAKISTAN: A COMPENDIUM,
by Raye R. Platt. June 61, 393p. incl. illus. tables, 82 refs.
(Contract Nonr-64101)
Unclassified report

DESCRIPTORS: (*Pakistan, History, Agriculture, Industry.)

19. NAVIGATION

AD-264 938 Div. 19, 8
(TIPSW/CRJ) OTS price $4.60

ITT Federal Labs., Nutley, N. J.
GLIDE PATH ANTENNA SYSTEM IMPROVEMENTS.
Final engineering rept.
Oct 60, 41p. incl. illus. tables.
(Contract FAA/BRD-164)
Unclassified report

DESCRIPTORS: (*Glide path systems, *Instrument landings, Airplane landings, *Antennas, Design, Analysis, Effectiveness, Tests.) (Terrain, Airports.)

Efforts were made (1) to construct the necessary hardware required to modify and improve the Glide Slope portion of an ILS installation, by utilizing a different antenna system, at a site where the Null-Reference antenna array was noncommissionable and the Sideband-Reference array yielded marginal results; and (2) to demonstrate the improvement realizable at certain types of FAA sites by actually conducting comparison flight tests at a facility where the terrain forward of the glide slope installation resulted in the situation mentioned. These efforts resulted in the following: (1) the M Array made a substantial improvement in the glide slope at McGhee-Tyson Airport, Knoxville, Tenn.; (2) an improvement can be obtained at other FAA sites which are marginal or uncommissionable due to terrain conditions such as exist at McGhee-Tyson Airport; and (3) optimum antenna height and calibration for width monitor should be investigated at the first permanent installation to determine if a location other than the path edge is desirable. (Author)

20. NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-264 723 Div. 20, 25
(TIPSP/MFA) OTS price $9.60

Illinois U., Urbana.
THE MOSSBAUER EFFECT IN IRON-57,
by Seymour Margulies. Oct 61, 112p. incl. illus. tables, 50 refs. (Technical rept. no. 28)
(Contract Nonr-183405)
Unclassified report

DESCRIPTORS: (*Nuclear fluorescent scattering in *Iron, Isotopes, *Nuclear resonance, Hyperfine structure, Radioactive isotopes.) (Fluorescence, Resonance, Scattering, Absorption, Quantum mechanics, Resonance absorption, Gamma ray spectra, Gamma emission, Fraunhofer lines.) (Experimental data, Groups (Mathematics), Least squares method, Tables.) (Instrumentation, Plating, Electrolytic cells.) Thesis, Bibliography.

A study is made of the Mossbauer effect in an isotope of iron (Iron-57). A brief history of nuclear resonance scattering and resonance fluorescence is presented. The experimental procedure is discussed in terms of the Doppler Shift Method and an experimental plating cell is described. Data in tabular form are given and an extensive bibliography is listed.

AD-264 804 Div. 20, 15
(TIPSP/MFA) OTS price $2.60

Stanford U., Calif.
EXTRAPOLATION TO CUTS AND THE SCATTERING OF ELECTRONS AND POSITRONS,
by S. D. Drell and R. H. Pratt. Aug 61, 24p. incl. illus. (Technical note no. 388-42)
(Contract AF 49(638)388)
(AFOSR-TN-1408) Unclassified report

DESCRIPTORS: (*Elastic scattering of *Electrons and *Positrons, Nuclei, Pions.) (Mathematical analysis, Functions, Equations, Integrals, Integration, Groups (Mathematics).)

The low momentum transfer region of strong interaction processes may be discussed in terms of one-pion-exchange graphs. This success of extrapolation to poles suggests, as an extension, extrapolation to cuts corresponding to low mass intermediate states containing two or more particles. This extrapolation may be performed in the case of electromagnetic interactions, owing to the vanishing photon mass. This leads to a simple approximate formula for the ratio R is identical with (Sigma(-) - Sigma(+))/(Sigma(-) + Sigma(+)) of electron and positron scattering, and to a simple method of determining the charge form factors of intermediate Z nuclei. (Author)

AD-264 805 Div. 20
(TIPSP/MFA) OTS price $2.60

Stanford U., Calif.
THE EFFECT OF THE 3 PI RESONANCE ON THE 2PI RESONANCE,
by R. Blankenbecler. Aug 61, 26p. incl. illus.
(Technical note no. 388-45)
(Contract AF 49(638)388)
(AFOSR-TN-1385) Unclassified report

DESCRIPTORS: (*Resonance scattering, Resonance, Mass energy relation, Nucleons, Pions, Particles.) (Functions, Numerical analysis, Equations, Integrals, Integration.)

It is shown that the 4pi intermediate state in pi-pi scattering plays an important role in determining the position and perhaps even the existence of the pi-pi resonance. This large effect occurs by virtue of the pi resonance. Quantitative estimates are given. The effect of this result on the nucleon form factors is briefly discussed and a simple model for these functions is proposed. The possibility of higher energy pion resonances is also considered. (Author)

AD-264 806 Div. 20
(TIPSP/WH) OTS price $2.60

Stanford U., Calif.
PARTICLE THEORY APPROACH TO THE TWO-PION AND THREE-PION SYSTEMS,
by L. I. Schiff. Aug 61, 23p. incl. illus.
(Technical note no. 388-46)
(Contract AF 49(638)388)
(AFOSR 1398) Unclassified report

DESCRIPTORS: (Particles, *Mesons, *Pions, *Nuclear reactions, Meson scattering, Nucleons, Nuclear forces.) (*Quantum mechanics, Bessel functions, Integrals, Integration.)

The relation between the two-pion and three-pion resonances is discussed in terms of a model in which the motion of the pions is described by a partially relativistic Schrodinger-type wave equation, and the interaction between them is represented by a static potential. An attractive square-well potential that is almost strong enough to bind the di-pion gives a satisfactory account of the observed P-wave pion-pion scattering. If this potential is assumed to be additive between all pairs in the three-pion I = 0, J = 1(-) state, it produces far too much binding to agree with observation. As an alternative to additivity, the interaction may be assumed to saturate, so that the total potential never exceeds that between any pair of pions. It is found that the model provides a qualitatively consistent explanation both of pion-pion scattering and the three-pion system if the pair interactions saturate or nearly saturate. (Author)

AD-264 957 Div. 20, 25, 30
(TIPSM/EJH) OTS price $3.60

Kansas U., Lawrence.
LIFETIME OF POSITRONS IN LIQUIDS AT HIGH PRESSURE,
by R. K. Wilson, P. O. Johnson, and R. Stump.
1961, 35p. incl. illus. table.
(AFOSR Grant no. 60-17)
Unclassified report

DESCRIPTORS: (*Liquids, Solids, Microstructure, *Positrons, *Positronium, Annihilation reactions, Quantum mechanics, Half life, Pressure, Temperature.) (High pressure research, High temperature research.) (Liquids, Methanols, Ethanols, Propanols, Butanols, Glycerols, Water, Benzenes.) (Solids, Acrylic resins, Polymers, Ethylenes, Fluorides or Styrenes.) Test methods, Test equipment.

The examination of the microscopic nature of a liquid by the use of positronium lifetime is unique in that the positronium lifetime depends on the size of regions of low density whereas x-ray and neutron diffraction depend on where the molecules are most dense. The reversal of the sign of the temperature effect on the lifetime is the most unusual effect observed here. Further work on x-ray diffraction at high pressure on liquids would help in the interpretation of the present results. (Author)

AD-264 981 Div. 20
(TIPSB/JAB) OTS price $16.00

Defense Atomic Support Agency, Washington, D. C.
SECOND SPECIAL REPORT ON THE HIGH ALTITUDE SAMPLING PROGRAM (HASP),
by Albert K. Stebbins, III. 1 Aug 61, 244p. incl. illus. tables, 134 refs. (Rept. no. DASA-539B)
Unclassified report

DESCRIPTORS: (Radioactive fallout, Sampling, Collecting methods, Filter papers, Reconnaissance planes.) (Atmosphere, Upper atmosphere, Stratosphere, Radioactivity, Radioactive isotopes, Measurement, Distribution, Dosage, Chemical analysis, Radiochemistry.) (*Radiation hazards, *Radiation effects, Gamma rays, X ray, Population, Man.)

A recalibration of the U-2 ducts has diminished the previous discrepancy noted in the flow rates. Absolute values of radionuclide concentrations are increased 8 to 13% by this recalibration. A discussion on the structure and nature of the 0.1 to 1.0 micron family of naturally occuring stratospheric aerosol is presented. This dust layer of ammonium sulfate appears to be generated in the stratosphere and may play an important role in lower stratospheric fallout processes. A detailed discussion of stratospheric concentrations of a number of nuclides is presented. Sr-90 and W-185 inventories and distributions from August 1957 to May 1960 are discussed. The tungsten stems from low altitude HARDTACK shots only while the strontium appears to show influx from Teak and Orange. Various possible modes of tropospheric-stratospheric interchange are discussed. A detailed discussion of fallout from Teak and Orange debris is presented. (Author)

Division 20-NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

AD-265 068 Div. 20
(TIPSB/MS) OTS price $17.50

Rocketdyne, Canoga Park, Calif.
ANALYTICAL STUDIES ON ION PROPULSION.
by J. H. Molitor and T. M. Littman. Apr 61, 276p. incl. illus. tables, 50 refs.
(Contract AF 49(638)649, Proj. 7116)
(ARL TR 60-320) Unclassified report

DESCRIPTORS: (*Ion accelerators, Ion beams, Ion rockets, Scattering, Rocket motors, Propulsion, Rocket propulsion.) (*Electric power production, Power plants, Electrodes, Configuration.) (*Ionization chambers, Simulation.)

This technical report discusses the major problems associated with ion rocket engine system components. Electrical power generation systems, thermal power conversion, and accelerating electrode configurations are explored in component studies. The content of this final report is divided into four main sections, namely, Thrust Device, Propellants for Electrical Propulsion, Mission Analysis, and Space Powerplant Study. (Author)

AD-265 239 Div. 20, 16
(TIPSB/CCH) OTS price $2.60

Naval Radiological Defense Lab., San Francisco, Calif.
THE RGI-20 RADIAC SYSTEM. A WIDE-RANGE BETA-GAMMA INSTRUMENT. PART I. SURVEY METER SKIN-DOSE PROBE,
by K. Miller and G. T. Kiyoi. 7 Sep 61, 31p. incl. illus. (Rept. no. NRDL-TR-523)
Unclassified report

DESCRIPTORS: (Dosage, Determination, Detection, Measurement of *Beta particles, *Gamma rays.) (Gamma counters, Beta counters, *Radiation counters and Detectors, Construction, Operation.) Design, Instrumentation, *Radiobiology, Skin.

Design criteria were established following a survey among radiac specialists in the three services, and among Laboratory personnel and civil defense instructors. The resulting design includes these features: (1) A low-impedance circuit giving 20% accuracy from -40 to +50 C, with no zero drift; (2) A 50-cu in. belt-carried package which satisfied Mil-E-16400 environment specifications; (3) Gamma rate from 1 to 1,000 rad/hr, skin-dose rate to 5,000 rad/hr (from a separable probe), each indicated on several linear meter scales; and (4) A connector for a four-decade, low-range probe, and other possible auxiliary probes. Six prototypes have been fabricated. Work is continuing toward packaging the low-range probe and toward reducing costs of manufacture. (Author)

AD-265 290 Div. 20
(TIPTP/MFA) OTS price $1.60

Queen's U., Belfast (Gt. Brit.).
EFFECT OF 2p.-2p+ COUPLING ON THE CROSS SECTION FOR EXCITATION OF THE 1s-2p TRANSITION OF ATOMIC HYDROGEN BY PROTON AND ALPHA PARTICLE IMPACT,
by B. G. Skinner. 1961, 11p. incl. illus.
(Contract N62558-2637)
Unclassified report

DESCRIPTORS: (Radiological physics, *Excitation, Alpha particles, *Alpha bombardment, Protons, *Proton cross sections, Proton bombardment, Atoms, Hydrogen, Atomic structure, Particle accelerators.) (Equations, Functions, Mathematical prediction, Numerical analysis, Real variables.)

AD-265 299 Div. 20, 1
(TIPSP/MFA) OTS price $11.50

RIAS, Inc., Baltimore, Md.
INVESTIGATION OF THE HEAVY COMPONENT OF THE PRIMARY COSMIC RADIATION.
Final rept.,
by L. Witten and H. Hanson. June 61, 103p. illus.
(Contract AF 19(604)3868)
(AFCRL-862) Unclassified report

DESCRIPTORS: (*Heavy elements, *Cosmic rays, Extraterrestrial radio waves.) (Atomic number, Alpha particles, Balloons.) (Detectors, Ionization chambers, Oscilloscopes, Pulse generators, Preamplifiers, Voltage amplifiers, Electronic equipment, Flight testing, Wiring diagrams.)

Two detectors were flown by balloons which can detect relativistic heavy charged particles and discriminate charges over a range from Z equals 4 to Z greater than or equal to 30. The detectors are argon-filled, double ionization chambers whose two halves are separated by a beryllium absorber. Relativistic charged particles will be little affected by the absorber and if they pass through equal lengths of the two chambers will produce pulses of equal heights. Non-relativistic particles will produce pulses of unequal heights. Hence the pulses caused by relativistic charged particles can be electronically singled out by obvious coincidence and difference techniques. The charge of the particle can then be determined from a measure of the pulse height. Such a system lends itself immediately to two functions. Kept aloft in a balloon for a period of days, it can measure the particle spectrum and diurnal variation of the flux of primary heavy cosmic radiation. . In a satellite it can operate even in the intense radiation belts surrounding the earth. (Author)

AD-265 372 Div. 20
(TIPSP/MFA) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D.C.
RECENT INFORMATION ON SOVIET THERMONUCLEAR FUSION RESEARCH.
19 Sep 61, 3p. (AID rept. no. 61-134)
Unclassified report

DESCRIPTORS: (*Thermonuclear reactions, Plasma physics, Magnetic fields, High frequency, Electric discharges, Energy.) (USSR, Translations.)

Three brief articles recently published in the Soviet popular press provide information on the Soviet fusion research program. The first two articles are reports from the recent IAEA conference on Plasma Physics and Controlled Nuclear Fusion Research in Salzburg written by G. Ostroumov, a special correspondent of Izvestiya. The third article was writen by Corresponding Member of the Academy of Sciences USSR V. S. Yemel'yanov, Chairman of the State Committee on the Uses of Atomic Energy of the USSR Council of Ministers, and concerns the Soviet program as a whole. (Author)

AD-265 407 Div. 20, 30
(TIPSP/MFA) OTS price $7.60

General Dynamic/Fort Worth, Tex.
FIRST-COLLISION MOMENTS METHOD.

by W. C. Farries. 30 Sep 61, 76p. incl. illus. tables, 14 refs. (Rept. nos. NARF-61-12T, MR-N-274 and FZM 2004A)
(Contract AF 33(600)38946)
Unclassified report

DESCRIPTORS: (*Neutron bombardment and *Nuclear moments in *Aircraft nuclear propulsion, Vehicles, Neutron cross sections, Shielding, Elastic scattering.) (Attenuation, Test equipment, Experimental data, Cylindrical bodies, Electrostatic accelerators, Neutron detectors.) (Numerical methods and procedures, Numerical analysis, Curve fitting, Geometry, Transformations (Mathematics), Tables.)

Dose rates resulting from fast neutrons that penetrate the walls of a shielded compartment are calculated by a First-Collision Moments (FCM) Method. The particular advantage of this method is that it can be applied to incident neutrons having arbitrary angular and energy distribution. A combination of single-scattering theory and moments-method data are used in the development of the FCM method. The results are presented in the form of a ratio of the transmitted dose rate to the initial dose rate for initial energies of 15, 10, 8, 5, 4, 2, and 1 Mev and incident angles of 30 degrees, 60 degrees, and 90 degrees. Calculated fast-neutron dose rates are compared with available measured dose rates. (Author)

AD-265 431 Div. 20, 16
(TIPSB/CCH) OTS price $.75

Polacoat, Inc., Blue Ash, Ohio.
FEASIBILITY STUDY AND DESIGN OF A SELF-ATTENUATING LIGHT VALVE.
Rept. on Health Hazards of Materials and Radiation,
by John F. Dreyer. Feb 61, 25p. incl. illus. tables.
(Contract AF 33(616)6715, Proj. 7165)
(WADD TR 60-827, supersedes Rept. no. WADC TR 59-81, AD-232 967) Unclassified report

DESCRIPTORS: (*Photochemical reactions, Materials.) (*Light adaptation to Nuclear explosions, Light, Thermal radiation, Intensity, Absorption, Attenuation, Sunglasses.)

The use of phototropic materials as self-attenuating light valves has been re-evaluated in the light of additional information. Sunglass application still appears to be feasible. As eye-protective devices to prevent flashblindness and retinal burns from nuclear detonations, phototropic filters appear to be feasible. However, it is impossible to state that they will provide complete eye protection under all operational conditions until more information is available on: (1) the absorption coefficients of the materials and (2) the tolerance of the human retina to short-duration, high-intensity radiation. (Author)

AD-265 447 Div. 20
(TIPSP/MFA) OTS price $1.60

Air Force Cambridge Research Labs., Bedford, Mass.
FLUX DISTRIBUTION AND CADMIUM RATIOS OF WATER-MODERATED NEUTRONS PRODUCED BY THE Li7(p,n)Be7 REACTION,
by L. F. Lowe and E. A. Burke. July 61, 8p. incl. illus. (AFCRL-573)
(Proj. 4608)
Unclassified report

DESCRIPTORS: (Particle accelerators, Van de Graaff generators, Neutron flux density, Nuclear physics, *Water boiler reactors, *Neutrons, Proton bombardment, Protons, Measurement, Gold on Aluminum, Sheets, Targets, Cadmium, Lithium, Beryllium.)

Measurements were made of the flux distribution and cadmium ratios of water-moderated neutrons produced in a thick lithium target by the lithium-beryllium reaction. A 3-Mev Van de Graaff generator (model KN) was used as the source of high energy protons. The moderator consisted of a 1.0 x 1.25 x 1.5 ft aluminum tank with a water level maintained at 12 inches. Pure gold 1-mg samples were used as neutron detectors. The flux rose at the wall adjacent to the lithium target to a maximum value at one inch along the target axis; it then decreased at 2.5 inches from the target. Similar results were found along other axes, displaced vertically and horizontally from the target axis, though lower in magnitude. The cadmium ratio increased from 3.65 at the target wall to 8.8 at 1.8 inches, decreasing slightly to 6.7 at 2.5 inches, also along the target axis. (Author)

21. NUCLEAR PROPULSION

AD-265 369 Div. 21, 20
(TIPSM/EJH) OTS price $1.60

Science and Tech. Section, Air Information Div., Washington, D. C.
SOVIET NUCLEAR INSTRUMENTATION AND CONTROL FOR PROPULSION.
Monthly rept. no. 7, 10 July-10 Aug 61, 10 Aug 61, 16p. incl. illus. table (AID rept. no. 61-130)
Unclassified report

DESCRIPTORS: (*Nuclear propulsion, Instrumentation, Control.) (*Reactor hazards, Control rods, *Reactor safety systems, Detectors, Design, Instrumentation.) (*Scintillation counters, Thermal neutrons, *Neutron detectors, Neutron counters, Effectiveness, Boric acids, Boron, Radioactive isotopes, Zinc compounds, Sulfides, Silver.) (*Flowmeters, *Pressure regulators, *Pneumatic servomechanisms, Porous filters, Design, Operation.) (*Nuclear power plants, Stainless steel, Aluminum alloys, Corrosion, Deposits, Cleaning, Chemical milling, Solutions, Chromium compounds, Oxides, Phosphoric acids.) (Laboratories, Coatings, Polymers, Vinyl chlorides.)

Contents:
Device for measuring excess reactivity in a reactor, by Z. Celinski.
On increasing the efficiency of a slow-neutron scintillation detector, by B. S. Grebenskiy and others
Measuring small flow rates of liquids, by L. L. Boshnyak and L. N. Byzov
Filters and pressure regulators, by I. M. Berkland and others
Cleaning corrosion products from the reactor circuits, by G. G. Andronov and N. K. Komarova
Protective coatings in radioactive installations, by A. N. Komarovskiy

22. ORDNANCE

AD-264 727 Div. 22, 8
(TIPSW/DLW) OTS price $1.10

Measurement Systems, Inc., Norwalk, Conn.
QUANTUM DETECTOR FOR MEASUREMENT OF EED BRIDGE WIRE TEMPERATURE RISE.
Monthly progress rept. no. 3, 1-30 Sep 61. 1 Oct 61, 4p. (Rept. no. ER-7024)
(Contract N178-7934)
Unclassified report

DESCRIPTORS: (*Electric bridges, Electric wire, *Electric detonators, *Electric igniters, Explosives, Electromagnetic waves, Electromagnetic effects, Temperature, Hazards, Measurement, Safety devices, Monitors, *Temperature warning systems, Design.) (*Detectors, Miniature electronic equipment, Optical equipment, Mirrors, Cryogenics, Cooling, Glass textiles, Lead compounds, Sulfides, Optical images, Test equipment, Effectiveness.)

Investigations were continued on (1) the energy density and quality of images produced by cylindrical and spherical mirrors, (2) the optical condensing system, (3) the feasibility of using fiber optics, (4) the optimum PbS detector, and (5) the design of a vibrating reed chopper. (Author)

AD-264 747 Div. 22, 10, 30
(TIPSM/REB) OTS price $1.60

Naval Ordnance Test Station, China Lake, Calif.
CALCULATION OF CRITICAL TEMPERATURE AND TIME-TO-EXPLOSION FOR PROPELLANTS AND EXPLOSIVES,
by P. A. Longwell. Mar 61, 16p. incl. illus. tables (NOTS Technical publication 2663)
(NAVWEPS rept. 7646) Unclassified report

DESCRIPTORS: (Mathematical prediction, Nomographs of Time and Temperature for *Explosions of *Propellants, *Explosives.) (Thermal conductivity, Heat transfer, Chemical reactions, Decomposition, Reaction kinetics, Mathematical analysis.) (Cylindrical bodies, Spheres, Configuration.)

The solutions available in the literature for the critical temperature of various geometric shapes and boundary conditions are gathered together, and a nomograph is presented, which greatly facilitates numerical calculation of the critical temperature for specific cases. Nomographs are also presented for the numerical calculation of the time required to cause explosion in the event the temperature at the surface of an object is held at a temperature greater than critical. (Author)

AD-264 760 Div. 22
(TIPSW/NTM) OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
UNDERWATER EXPLOSION TESTS IN A PRELIMINARY HIGH-GRAVITY TANK ACCELERATED BY A CENTRIFUGE,
by Robert S. Price. Aug 61, 16p. incl. illus. tables.
(NAVWEPS Rept. no. 7365; DASA-1241)
Unclassified report

DESCRIPTORS: *Underwater explosions, Tests, Simulation, Gravity, Centrifuges, Acceleration, Model basins.

NOL is developing a high-gravity tank for simulating large underwater explosions at a very small scale. To determine if a centrifuge, rather than the previously proposed linear accelerator, could be used to provide the acceleration, six explosion tests using 50-milligram charges were made. Radial accelerations up to 60 gravities prevailed in a 7-inch square test tank mounted on a 10-foot centrifuge arm. Since the explosion phenomena were not objectionably distorted by the rotation effects, it was concluded that a centrifuge is suitable for providing the acceleration forces required for the proposed NOL High-Gravity Tank. (Author)

AD-264 763 Div. 22
(TIPSM/SEB) OTS price $10.50

North American Aviation, Inc., Downey, Calif.
SANDWICH ROCKET MOTOR CASE PROGRAM.
Interim technical engineering rept. no. 1, 29 June-29 Sep 61,
by C. Boogaard, F. L. Rish, and R. W. Spencer. Oct 61, 123p. incl. illus. tables (Rept. no. SID61-322)
(Contract AF 33(600)43031)
(AMC Interim 7-878, vol. 1) Unclassified report

DESCRIPTORS: (Design, Feasibility studies of *Sandwich construction for *Rocket cases in Guided missiles.) (Monocoques, Sandwich construction, Filament wound construction, Honeycomb cores, Mechanical properties, Temperature, Pressure, Ablation, Tests.) (Materials, Glass textiles, Aluminum, Stainless steel, Titanium, Beryllium.) (Resin adhesives, Bonding, Materials, Sandwich construction.)

The structural efficiency of upper-stage solid propellant rocket motor casings can be improved in specific applications by the use of the structural sandwich-type construction. Of the various sandwich materials considered on an analytical basis, the filament-wound fiberglass facings adhesively bonded to an Al core proved to be the most efficient structure. Materials investigated, in addition to the glass filament, were stainless steel, Ti, Al, and Be. Preliminary weight analysis of the anticipated design indicates potential booster mass fraction of 0.945 to 0.95 can be obtained by proper design and careful manufacturing techniques. Further improvements are possible with the use of advanced propellants which burn at characteristically low chamber pressures, and the use of high-strength filaments in conjunction with improved resin systems. (Author)

AD-264 770 Div. 22, 30
(TIPSW/CRJ) OTS price $9.60

Philco Corp., Willow Grove, Pa.
SUBSYSTEM SSIA (AUTOMATIC DATA PROCESSING SYSTEM FOR FIELD ARTILLERY APPLICATIONS).
Quarterly progress rept. no. 4, 1 Apr-30 June 61, by H. Glazer and F. Ungerman. 30 June 61, 1v. incl. illus.
(Contract DA 36-039-sc-85146)
Unclassified report

DESCRIPTORS: (*Data processing systems, Artillery, *Artillery fire, Design, Programming.) Fire control computers, Data transmission systems, Automatic, Display systems.

AD-264 834 Div. 22, 17, 26
(TIPSM/BRW) OTS price $2.60

Watertown Arsenal Labs., Mass.
TITANIUM ALLOY FOR T-109 MEDIUM TANK TRACK DEVELOPMENT OF PROCESSING PROCEDURES AND MANUFACTURING TECHNIQUES.
Report on Terminal Ballistic Protective Systems for Vehicles,
by Ernest N. Kinas. July 61, 24p. incl. illus. tables (Technical rept. no. WAL TR 401.5/1)
Unclassified report

DESCRIPTORS: (Tanks, *Vehicle tracks, Materials, *Titanium alloys, Aluminum alloys, Vanadium alloys, Processing, Manufacturing methods, Forging, Heat treatment, Mechanical properties, Surface properties, Physical properties, Tensile properties, Impact shock.) (Titanium alloys, Machining, Drilling machines, Taps, Screw threads, Surfaces, Preparation, Pickling, Sandblasting, Flame spraying, Bonding, Rubber adhesives.)

A program was conducted to develop processing procedures and manufacturing methods for fabrication of one set of Ti alloy tank tracks for the T-95E2 Medium Tank. A Ti alloy (7Al-4V) having equivalent mechanical properties was used as a substitute for the originally specified steel. Other results obtained were the development of rubber bonding methods for Ti development of optimum mechanical surface treatment for as-forged surfaces, and development of new and unique hot-working techniques. This program provided 152 tank track units which will be utilized by Ordnance Tank-Automotive Command in field service tests. (Author)

AD-264 855 Div. 22, 14, 4, 25
(TIPSM/SEB) OTS price $7.60

Army Rocket and Guided Missile Agency, Huntsville, Ala.
QUARTERLY RESEARCH REVIEW NO. 29, 1 FEBRUARY-30 APRIL 1961.
1 Aug 61, 68p. incl. illus. tables, 28 refs.
(Rept. no. ARGMA TN 2H1N-29)
Unclassified report

DESCRIPTORS: (*Rocket motors, *Rocket motor nozzles, Materials, Preparation, Tests.) (Reinforcing materials, Phenolic resins, Machanical properties, Machining.) (*Tantalum compounds, *Carbides from Vapors of Tantalum compounds, Chlorides and Hydrogen into Porous materials Graphite.) (*Boron, Deposits from Decomposition of Boron compounds, Chlorides.) (Yttrium, Niobium, Radioactive isotopes from Bombardments of *Zirconium, Gamma-ray spectroscopy, Radioactive decay.) (Butane and *Nitrogen compounds, *Fluorides, Combustion.) (Plasma physics, *Plasmajets, Magnetohydrodynamics, Magnetic effects, Ablation.) (*Tungsten compounds, Ignition.) (Combustion in Vortices.) (Electrons, Scattering.)

Contents: Mechanics of reinforced phenolic sheets; Nozzle materials; Crystalline boron preparation; Decay and production of radioactive Y; Burning rate studies on fuels; Vortex combustion; High temperature physics; Magnetic effects on the arc characteristics of plasma jets; F-values determination in spark discharge; and Multiple scattering of electrons.

AD-264 886 Div. 22
(TIPSW/NTM) OTS price $2.60

Ammunition Group, Picatinny Arsenal, Dover, N. J.
MALFUNCTION INVESTIGATION OF SIMULATOR, BOOBY-TRAP, FLASH: M117 SIMULATOR, BOOBYTRAP, ILLUMINATION; M118 AND SIMULATOR, WHISTLING: M119,
by Alice M. Alexander and John McPartland.
Aug 61, 31p. incl. illus. (Technical rept. no. DC-TR-3-61)
Unclassified report

DESCRIPTORS: (Simulation, *Explosives of *Camouflage, Reliability, *Firing mechanisms, Flash, Illumination, Test methods, Tests.) (*Antipersonnel ammunition, Simulation, *Mines.)

A malfunction investigation was conducted on Boobytrap Simulator M118. The investigation disclosed a greater force on the pull cord was needed. This was done by the use of a spring with increased tensile strength and through a change in procedures for setting up the simulator to obtain full energy from the spring action. Various tests were made with the old and new spring and procedures. The investigation also showed that certain test procedures were impractical and unrealistic in that they permit the acceptance of certain simulators, which do not meet requirements for use in the field. It was concluded that improved performance will be obtained from these Boobytrap simulators through the use of the improved spring and the new procedures in setting up the simulators. Drawings and published procedures will be revised accordingly. By retesting under the new procedures and using the improved spring, it will be possible to remove from suspension lots that have been placed in Grade III (unserviceable) because of pull cord failure. (Author)

AD-264 895 Div. 22
(TIPSW/RD) OTS price $1.10

Miller Research Labs., Baltimore, Md.
PRODUCTION ENGINEERING OF PLASTIC COMPONENTS FOR 81 MM T214E2 ILLUMINATING CARTRIDGE.
Progress rept. 1-31 Aug 61,
by E. R. Briggeman. 12 Sep 61, 8p. incl. illus. (Rept. no. 251-2)
(Contract DA 36-034-ORD-3468)
Unclassified report

DESCRIPTORS: (*Cartridges, *Illuminating projectiles, Production, Tests.) (Tail fuzes, Spoilers, Plastics.)

AD-264 990 Div. 22, 8
(TIPSW/NTM) OTS price $2.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
PRECISION RF SENSITIVITY STUDIES (EVALUATION OF MARK 1 SQUIB AND MARK 2 MOD 0 IGNITION ELEMENT).
Quarterly progress rept. no. 3, 1 May-1 Aug 61,
by Paul F. Mohrbach and Robert F. Wood. 1 Aug 61. 23p. incl. illus. tables (Rept. no. Q-B1805-3)
(Contract N178-7830)
Unclassified report

DESCRIPTORS: (*Electric detonators, *Electric igniters, Radiofrequency, Sensitivity, Tests.) (Impedance matching, Measurement, Errors, Impedance, Impedance bridges.) (Infrared detectors, Instrumentation, Thermocouples, Calibration, Standing wave ratios, Infrared photoconductors.) (Tuning devices, Heaters.) (Thermocouples, Substitutes.) Test equipment.

Evaluation of a specific matching system for firing the MARK 2 MOD 0 ignition at 250 mc is discussed. Data for the impedance and VSWR of RF thermocouples are presented. However, the use of these thermocouples was discontinued. An IR detector mounted above a bridgewire is being used in place of the thermocouples. A system for firing the MARK 2 at 250 megacycles was assembled. The mount for the ignition element was redesigned. Losses in the RF firing system are described in detail. A prerequisite to the establishment of this factor was the evaluation of the loss in the base of the MARK 2. This value was concluded to be insignificant at frequencies below 250 megacycles although it is expected to assume prominence at elevated frequencies. The over-all efficiency of the matching system is about 41%. A 100-point Bruceton sensitivity test was conducted with the MARK 2. Applying the correction factor of 0.41 to the mean firing level, a figure close to the dc level was obtained. (Author)

AD-265 069 Div. 22
(TIPSW/NTM) OTS price $10.50

Aerojet-General Corp., Downey, Calif.
SHAPED CHARGE HYPERVELOCITY FRAGMENT PROJECTOR STUDY. DEVELOPMENT OF FRAGMENT PROJECTION AND INSTRUMENTATION TECHNIQUE.
Final rept.,
by J. L. Squier. Sep 61, 134p. incl. illus. tables, 42 refs. (Rept. no. 0377-01(15)FP)
(Contract AF 08(635)975)
(APGC TR 61-42) Unclassified report

DESCRIPTORS: (*Hypervelocity projectiles, *Shaped charges, Ammunition fragments, Tests, Design, Fragmentation, Terminal ballistics, Projector charges.) (Instrumentation, X-ray diffraction cameras, Flash radiography, High speed cameras, Spark shadowgraph photography.)

A technique-development program was conducted with the ultimate goal of providing terminal ballistics data for hypervelocity fragments striking selected targets. Shaped-charge hypervelocity fragment projectors and instrumentation techniques were developed and tested which will permit the gathering of terminal ballistics data for fragments one grain and larger in size when they impact targets at velocities between 30,000 and 40,000 ft/sec. The fragment projectors developed were shaped charges with conical liners of small apex angle (42 degrees, 30 degrees, 25 degrees, 20 degrees). Special designs and techniques were developed for separating the points of impact of the fragments, and for limiting, eliminating, or preventing undesired fragments. Instrumentation techniques included the application of flash radiographic instrumentation providing sequential and orthogonal views of the fragments immediately prior to impact, a high-speed framing camera observing the target-impact process, and other auxiliary and supplementary equipment. The projectors and their performance, the instrumentation and its operation are described and briefly reviews the problems encountered and solutions provided during the development program. Some of the problems which remain unsolved, along with plans for their solution, are also discussed. (Author)

AD-265 076 Div. 22, 9
(TIPSW/RD) OTS price $2.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
TRANSIENT SKIN EFFECTS IN EXPLODING WIRE CIRCUITS,
by F. D. Bennett. Aug 61, 32p. incl. illus.
(BRL rept. no. 1137)
(Army Proj. 503-03-009)
Unclassified report

DESCRIPTORS: (*Exploder mechanisms, Wire.) (Electric currents, Alternating current, Measurement, Resistance.) (Plasma physics, Shock waves, Integral transforms, Mathematical analysis.) (Test equipment, Aerodynamics.)

The transient response of the coaxial, current-measuring shunt commonly used in high-current, high frequency applications (up to 1 mc) is analyzed by Laplace transform methods. An approximate solution is obtained which allows estimates to be made of the errors expected. The current shunt measuring a damped oscillation will always report an initial current slope of zero, and the maximum rate of current rise is sensed shortly after switch-on. It is several percent low in typical cases. At the first current maximum, the shunt reading is a few tenths percent high and lags the impressed current by a small fraction of a cycle. The transient resistance of an idealized plate condenser is analyzed using the asymptotic solution for current. A numerical calculation indicates no alteration of initial conditions on the damped oscillation to arise from this source, so long as the characteristic damping time of the transient skin effect is small compared with the ringing time. (Author)

AD-265 118 Div. 22, 14
(TIPSB/CCH) OTS price $1.60

Army Infantry Board, Fort Benning, Ga.
SERVICE TEST OF PLASTIC STOCKS FOR RIFLE, 7.62MM, M14.
29 Sep 61, 20p. incl. illus. tables.
(Proj. 2920)
Unclassified report

DESCRIPTORS: (Tests of *Guns, Materials, Plastics, Polymers.) (Climatic factors, Heat, Air drop operations, Operation, Physical properties.) Polymerization, Impregnation.

Investigation was undertaken to determine the suitability of plastic stocks for Rifle, 7.62mm, M14, for Army use under temperate environmental conditions. Plastic stocks for Rifle, 7.62mm, M14 are fabricated from fiberglas material and cut fibers. The test stocks are molded in two halves and then assembled in a fixture using an epoxy resin adhesive for binding. To provide additional strength of binding, three knurled aluminum pins are used in assembly of the two halves. These pins are inserted in opposing oversize holes filled with epoxy resin adhesive in each half of the stock. The pins are employed merely to provide additional shear area for the adhesive. Small overlays of glasscloth are then placed over the seam. Each half of the test stock consists of three layers of 1 1/2 ounces of glass material pre-impregnated with colored polyester resin. Tests of physical characteristics, effects upon weapon accuracy, effects upon weapon functioning, and durability, adverse conditions, retention of heat, suitability for mounting the M15 Grenade Sight, and aerial delivery were made. The plastic stock is suitable for conventional Army use with the Rifle, 7.62mm, M14, under temperate environmental conditions. The test stock is interchangeable with and can be used as a substitute for the standard item now in production.

AD-265 123 Div. 22
(TIPSM/EJH) OTS price $9.10

Feltman Research Labs., Picatinny Arsenal, Dover, N. J.
BURNING CHARACTERISTICS OF STANDARD GUN PROPELLANTS AT LOW TEMPERATURES (21 TO -52 C),
by Lester Shulman, Joel Harris, and Charles Lenchitz. Nov 61, 101p. incl. illus. tables.
(Technical rept. no. FRL-TR-41)
(Proj. WDOAC-4700-142-19-99105)
Unclassified report

DESCRIPTORS: (*Propellants, Ammunition, Guns, Combustion.) (*Nitrocellulose, *Nitroglycerin, *Potassium compounds, *Nitrates, *DNT, Combustion, Low temperature research, Temperature, Pressure, Loading, Density.) (Test equipment, Bombs.)

The burning characteristics of M-1, M-2, M-6, M-10, M-15, M-17, T-28, T-34, and T-36 propellants were determined in a closed bomb between -52 and +21 C. Burning rates for most of these propellants either decreased 1 to 2%/10 C decrease in temperature or remained essentially constant throughout the temperature range. The apparent burning rate of the M-17 propellant, however, increased abruptly at -21 C. The maximum pressure developed by these propellants at -52 C averaged 7% less than the pressure developed at ambient temperature. Equations for the pressure-burning rate relationship as well as temperature coefficients of burning rate were calculated. The effect of loading density on the maximum pressure is shown to be highly significant, and its effect on burning rate is also discussed. (Author)

AD-265 281 Div. 22
(TIPSB/JAB) OTS price $1.10

Remington Arms Co., Inc., Bridgeport, Conn.
DEVELOPMENT AND MANUFACTURE OF SPECIAL CALIBER .30 ELECTRIC PRIMERS.
Monthly progress rept. no. 4, 1 July-31 Aug 61, by Theodore B. Johnson. 18 Sep 61, 8p. incl. tables.
(Contract DA 19-020-ORD-5379, Proj. TN1-2707)
Unclassified report

DESCRIPTORS: (*Electric primers, Switches, Reliability, Primers, Mixtures, Conductivity, Electrodes, Explosive trains, Production, Tests.)

It appears probable that the residue problem has been solved through a compromise which, while not eliminating residue, has reduced the quantity and character of the residue so that it cannot bridge the gap between the electrodes. At this time we cannot say definitely that a charge weight of XP407 priming mixture intermediate to 0.24 gr. and 0.31 gr. will operate the switch reliably and safely. However, if it does not, we can say that some means of holding the switch assembly together more strongly must be found. (Author)

AD-265 457 Div. 22, 8
(TIPSW/NTM) OTS price $1.60

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
DEVELOPMENT OF A UNIVERSAL RADIO FREQUENCY PROTECTED SQUIB.
Quarterly progress rept. 20 June-30 Sep 61, by Paul F. Mohrbach and Melvin R. Smith. 30 Sep 61, 12p. incl. illus. table (Rept. no. Q-B1856-1)
(Contract N178-7902)
Unclassified report

DESCRIPTORS: (*Electric detonators, *Electric igniters, Electromagnetic waves, Hazards.) (*Radiofrequency filters, Low pass filters, Radiofrequency attenuators, Safety devices, Effectiveness.) (Transistors, Electronic switches.)

Research is concerned with developing an electroexplosive device (EED) which will be protected against accidental initiation by radio frequency energy. The latest state-of-the-art techniques will be applied with the objective of minimizing the RF hazard; size and firing characteristics of the EED being of secondary consideration. Various types of filters have been studied to determine their ability to attenuate RF signals at frequencies above 20 kilocycles per second. One of these filters promises to supply at least 30 db insertion loss from 20 Kc to 500 Kc. Others promise adequate attenuation at frequencies above 10 Mc. Two solid state devices have been investigated; a dissipative capacitor and a transistor switch. The dissipative capacitor will require further development before we can determine its worth as a protective device. The transistor switch provides adequate protection but requires a more complicated firing circuit than normally used. (Author)

AD-265 473 Div. 22, 8
(TIPSW/DLW) OTS price $12.50

Jansky and Bailey, Inc., Washington, D. C.
ELECTROMAGNETIC COUPLING TO ORDNANCE SYSTEMS.
Final rept. on Phase 1 and 2, by M. M. Abromavage, C. C. Merchant, and L. de Pian. 25 Aug 61, 167p. incl. illus. tables.
(Contract N178-7604)
Unclassified report

DESCRIPTORS: (*Electromagnetic waves, Radiofrequency power, Radiation effects, Electric fields, Wave transmission, *Electric detonators, Electric igniters, Hazards, Reduction.) (Ordnance, Guided missiles, Rockets, Guided missile launchers, Rocket launchers, Coupling circuits, Electric cables, Electrical networks, Analysis.) (Antennas, Electric fields.) Electromagnetic fields.

Experimental and analytical procedures are presented for the measurement and analysis of transmission of energy from electromagnetic radiators to electrically initiated devices of ordnance systems. Several methods of analysis are presented which are applicable to the transmission of energy along electric circuits from the exterior to the interior of the ordnance device. A method is also presented which applies to the direct entry of electromagnetic wave energy into the interior of a missile through openings in the missile body, such as arming hatches, radomes, and others. A section is included which gives the magnitude of the sum of the radiation and quadrature components of the electric field produced by vertical radiators in a form which is especially useful for computing the hazards of electromagnetic radiation to ordnance (HERO). (Author)

23. PERSONNEL AND TRAINING

AD-265 399 Div. 23
(TIPSB/MS) OTS price $3.60

Human Resources Research Office, George Washington U., Washington, D. C.
A PROVISIONAL CORE CURRICULUM FOR INFANTRY

NIGHT OPERATIONS TRAINING. CONCEPTUALIZATION AND PROPOSED CONTENT.
Research memo., .
by Gilbert L. Neal. Dec 60, 32p. incl. table.
Unclassified report

DESCRIPTORS: (*Military training, *Night warfare, Military operations.)

An analysis of infantry night operations problems suggests (1) the greatest area of operational weakness lies in the dismounted night tactical operation, and (2) night training for the individual Light Weapons Infantryman pays insufficient attention to the fundamental skills in which he must be proficient prior to his becoming a satisfactory night fighter. Tactical doctrine and procedures for the small infantry unit were analyzed and eight general individual performance requirements which seemed to represent fundamental skill performance were identified. These eight performance requirements were translated into eight categories of content, Fundamental Individual Night Skills Areas, around which a core curriculum for night operations will be organized. The names of these categories are: General Night Environmental Familiarization, Night Direction Finding, Night Target Detection, Avoidance of Detection at Night, Coordinated Night Movement, Intra-Team Communication at Night, Night Target Engagement, and Tactual Discrimination and Manipulation Training. The performance requirements, concept of training, expected performance gains, and relationship among FINS Areas were briefly discussed. The core curriculum was reviewed by seven departments of the United States Army Infantry School, and there was general agreement the curriculum was complete, but should be reviewed periodically. (Author)

24. PHOTOGRAPHY AND OTHER REPRODUCTION PROCESSES

AD-265 371 Div. 24
(TIPSP/MFA) OTS price $1.10

Science and Tech. Section, Air Information Div., Washington, D. C.
SYMPOSIUM ON THE PHYSICAL PRINCIPLES OF ELECTROPHOTOGRAPHY,
by V. M. Fridkin. 15 Sep 61, 4p. (Trans. from Uspekhi Fizicheskikh Nauk, 74:567-570, July 61)
(AID rept. no. 61-133)
Unclassified report

DESCRIPTORS: (*Electrophotography, *Symposia, *USSR, Crystal structure.) (Processing, Electrets, Photography, Electric fields, Polarization of Dielectrics, Luminescence, Electrical corona, Wave transmission.) (Inorganic substances, Zinc compounds, Copper compounds.) (Cathode ray tubes, Oscillographs.) (Electrostatics, Mechanics, Kinetic theory.)

Results are reported from a symposium in the USSR on the physical principles of electrophotography. More than 15 scientific organizations with 100 representatives met at which 22 reports covering specific areas of electrophotography were presented.

25. PHYSICS

AD-264 709 Div. 25
(TIPSP/WH) OTS price $8.10

Laboratory of Astrophysics and Physical Meteorology, Johns Hopkins U., Baltimore, Md.
PRECISE DETERMINATION OF ATMOSPHERIC DISPERSION WITH APPLICATIONS TO LONG-PATH INTERFEROMETRY. Progress rept.,
by Kent E. Erickson. 1961, 85p. incl. illus. tables, 32 refs.
(Contract Nonr-24801)
Unclassified report

DESCRIPTORS: (*Diffraction, *Light, Atomosphere, Determination, Air, Nitrogen, Oxygen, Humidity, Light transmission.) (Optics, Interferometers.)

The accuracy with which it is feasible by purely interferometric means to separate information about geometric path differences was investigated from information about the optical density of the atmosphere. A precision refractometer was designed and measurements were made of the relative dispersions of air, water vapor, nitrogen, and oxygen in the region from 3800 to 6400 Angstroms. The results for air show a high degree of invariance under changes in pressure and reveal a slight deviation from the relative dispersion given by Edlen's formula. Results for nitrogen and oxygen conform well with the Clausius-Mossotti relation as applied to air. An analysis was made of the errors which would affect interferometric comparisons of long paths through an uncontrolled atmosphere. Results showed that humidity variations are the most serious and that variations of 1% in the relative humidity at 15 C would cause errors of approximately 2 parts in 10 to the eighth power. The feasibility of obtaining interference at large distances under controlled conditions was investigated. (Author)

AD-264 725 Div. 25
(TIPSP/MFA) OTS price $2.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
LOCAL MAGNETOHYDRODYNAMIC INSTABILITIES IN A COLLISIONLESS PLASMA WITH ANISOTROPIC PRESSURE.
by Kjell F. Voyenli. 8 June 61, 19p. incl. illus. (Technical rept. no. 388)
(Contract DA 36-039-sc-78108, Proj. 3-99-00-000)
Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, Stability, *Plasma physics, Energy, Magnetic fields, *Pressure.) (Equations, Partial differential equations, Operators (Mathematics), Transformations (Mathematics).)

The local magnetohydrodynamic stability of static equilibrium states in a collisionless plasma in a magnetic field with anisotropic pressure is discussed by using an energy principle. The discussion is mainly limited to one class of static equilibrium states. In this class the difference between the components of the pressure perpendicular and parallel to the magnetic field is proportional, along each field line, to the square of the magnetic field strength. For each equilibrium state in this class it is possible to define an associated equilibrium state with isotropic pressure, in terms of which the possible equilibrium states can be completely discussed. It is also shown that the stability of any anisotropic equilibrium state can conveniently be discussed in terms of the stability of its associated isotropic state. Complete conditions for stability are found for the uniform equilibrium state. The additional complications that are introduced by nonuniformity of the equilibrium state can be completely understood from the associated isotropic state. Certain comparison theorems for nonuniform equilibrium states are found and, finally, a class of nonuniform equilibrium states with straight field lines is discussed, for which it is shown that stability conditions are the same as in the uniform case. (Author)

AD-264 738 Div. 25
(TIPSP/JDP) OTS price $7.60

Institute of Mathematical Sciences, New York U., N. Y.
STOCHASTIC MODELS FOR MANY-BODY SYSTEMS. I. INFINITE SYSTEMS IN THERMAL EQUILIBRIUM,
by Robert H. Kraichnan. July 61, 74p. incl. illus. (Research rept. no. HT-9)
(Contract AF 49(638)341, Proj. 47501)
(AFOSR-1137) Unclassified report

DESCRIPTORS: (*Thermodynamics, *Perturbation theory, Quantum statistics, Particles.) (Quantum mechanics, Potential theory, Statistical processes.)

Some model Hamiltonians are proposed for quantum-mechanical many-body systems with pair forces. In the case of an infinite system in thermal equilibrium, they lead to temperature-domain propagator expansions which are expressible by closed, formally exact equations. The expansions are identical with infinite subclasses of terms from the propagator expansion for the true many-body problem. The two principal models introduced correspond, respectively, to ring and ladder summations from the true propagator expansions, but augmented by infinite classes of self-energy corrections. The latter are expected to yield damping of single-particle excitations. The eigenvalues of the ring and ladder model Hamiltonians are real, and they are bounded from below if the pair potential obeys certain conditions. The models are formulated for fermions, bosons, and distinguishable particles. In addition to the ring and ladder models, two simpler types are discussed, one of which yields the Hartree-Fock approximation to the true problem. A novel feature of all model Hamiltonians (except the Hartree-Fock) is that they contain an infinite number of parameters whose phases are fixed by random choices. Explicit closed expressions are obtained for the Helmholtz free energy of all the models in the classical limit. (Author)

AD-264 739 Div. 25
(TIPSP/JDP) OTS price $3.60

Institute of Mathematical Sciences, New York U., N. Y.
BOUNDS ON ELEMENTS OF THE S MATRIX FOR ELASTIC SCATTERING: ONE DIMENSIONAL SCATTERING,
by Ralph Bartram and Larry Spruch. June 61, 31p. incl. illus. tables, 14 refs. (Research rept. no. CX-55)
(Contracts AF 19(604)4555; DA-30-069-ORD-2581; Nonr-28549, Proj. no. 012-109)
(AFCRL-646) Unclassified report

DESCRIPTORS: (*Elastic scattering, Neutron scattering, Proton scattering, Mathematical

analysis, *Quantum mechanics, *Matrix algebra, Calculus of variations, Numerical methods and procedures.) (Particles, Electromagnetic waves, Scattering, Mathematical analysis, Quantum mechanics, Matrix algebra, Calculus of variations.)

Multi-channel scattering in which the scattering matrix cannot be diagonalized a priori is considered. The Schroedinger equation is cast into a form in which the potential is a real symmetric N by N matrix and the wave function is an N by 1 matrix. The equation for neutron protron scattering with tensor forces is written in matrix form with N equals to 2; the same is true for the problem of one-dimensional scattering. Upper and lower bounds are determined on the elements of the S matrix, the N by N matrix which relates the N outgoing waves to the N incoming waves. (Author)

AD-264 796 Div. 25, 8
(TIPSP/GW) OTS price $1.10

Space Technology Labs., Los Angeles, Calif.
REFLECTION OF ELECTRICAL WAVES FROM THE WIRES OF A HERTZIAN GRATING PARALLEL TO THE MAGNETIC VECTOR (Otrazhenie Elektricheskikh Voln Ot Provolok Reshetki Gertza Parallel 'Nykh Magnitnomu Vektoru),
by O. I. Kozinyets, tr. by Z. Jakubski. Oct 61, 10p. incl. illus. (Rept. no. STL-TR-61-5110-49, Trans. from Sbornik Problemy Ferromagnetisma I Magnetodinamiki Akad. Nauk SSSR, Moskva, pp-89-92, 1946)
Unclassified report

DESCRIPTORS: (*Electric currents, *Magnetic fields, *Ferromagnetism, Electrical conductance, Electromagnetic wave reflections.) (Iron and Copper wire, Magnetic effects, Mathematical analysis, Differential equations.

AD-264 803 Div. 25
(TIPSP/MFA) OTS price $2.60

Stanford U., Calif.
NON-ABELIAN GAUGE FIELDS. COMMUTATION RELATIONS,
by Julian Schwinger. Aug 61, 23p. incl. illus.
(Technical note no. 388-44)
(Contract AF 49(638)388)
(AFOSR-TN-1409) Unclassified report

DESCRIPTORS: (Electromagnetic theory of *Electromagnetic fields by Algebraic topology and *Groups (Mathematics), Quantum mechanics, Particles, Photons.) (Magnetic fields, Gravity, *Commutators.) (Transformations (Mathematics), Operators (Mathematics), Matrix algebra, Differential equations, Green's function.)

The question is raised for non-Abelian vector gauge fields whether gauge invariance necessarily implies a massless physical particle. As a preliminary to studying this problem, the action principle is used to discover the independent dynamical variables of such gauge fields and construct their commutation relations. (Author)

AD-264 810 Div. 25
(TIPSP/WH) OTS price $11.50

Electrical Engineering Research Lab., U. of Texas, Austin.
TOTAL ATTENUATION, SCATTERING, AND ABSORPTION CROSS-SECTIONS OF WATER DROPS FOR INFRARED RADIATION,
by J. J. Stephens. 31 Aug 61, 146p. incl. tables (Rept. no. 4-05)
(Contract AF 19(604)7279)
(AFCRL-1011) Unclassified report

DESCRIPTORS: (Drops, Spheres, Raindrops, Particles, *Precipitation, Ice, Hail, *Infrared radiation.) (Tables, *Probability, Attenuation, *Scattering, Reflection.)

Total attenuation, scattering, and absorption cross-sections are presented for 35 wavelengths from 4 microns to 90 microns for spherical water drops with diameters from 1.0 microns to 10.0 microns. (Author)

AD-264 816 Div. 25
(TIPSP/GW) OTS price $2.60

Tracerlab, Inc., Waltham, Mass.
THE FOCUSSING OF X-RADIATION BY PARABOLIC MIRRORS,
by Paul B. Fredrickson. 3 Aug 61, 19p. incl. illus.
(Contract AF 30(602)2189, Proj. 4519)
(RADC TN 61-153) Unclassified report

DESCRIPTORS: (Focusing, *X rays by *Curved mirrors.) (X rays, Angle of arrival, Refractive index, Reflection, Intensity, Determination, Differential equations.)

A parabolic mirror system, which is capable of focussing x rays from a point source, is described. Since x rays are reflected only when the angle between the plane of the mirror and the incident ray is small, the mirror can focus only a limited portion of the total radiant x-ray flux. This grazing angle depends upon the reflector material as well as the energy of the x-ray photon. The intensity of reflection for a few suitable materials is also presented. If the source is not a perfect point source, the x-ray beam is divergent. The relation between source size and beam divergence angle is also discussed. (Author)

AD-264 819 Div. 25, 4
(TIPSM/TCG) OTS price $1.60

Uppsala U. (Sweden).
THE CRYSTAL STRUCTURE OF SbCl5.SO(C6H5)2,
by Arne Hansson and Margareta Vanngard.
20 Apr 61, 15p. illus. tables, 14 refs. (Technical note no. 14)
(Contract AF 61(052)43)
(AFOSR-477) Unclassified report

DESCRIPTORS: (*Crystals, *Crystal structure, Complex compounds, *Antimony compounds, *Chlorides and *Phenyl radicals, *Sulfoxides, Measurement, X-ray diffraction analysis.) (Synthesis, Crystals from Carbon tetrachloride, Solutions.) (Crystals, Chemical bonds, Molecular association, Stability.)

The crystal structure of SbCl5.SO(C6H5)2 was determined from 3-dimensional X-ray data. The crystals were prepared from a mixture of a solution of 0.40g (C6H5)2SO dissolved in 30 ml CCl4 and a solution of 0.25 ml SbCl5 in 30 ml CCl4. The structure was made up of SbCl5.SO(C6H5)2 molecules, and coordination around the Sb atom was octahedral. The O and Sb atoms in (C6H5)2SO and SbCl5 functioned as donor and acceptor atoms, respectively. Coordinate, bond angle, and molecular distance data are given. The bond between the O and Sb atoms was weak. The stability of the addition compound was attributed to secondary effects.

AD-264 835 Div. 25, 15
(TIPSP/MFA) OTS price $4.60

Weizmann Inst. (Israel).
USE OF THERMAL GREEN'S FUNCTION FOR THE ELECTRON-ION INTERACTION IN SUPERCONDUCTORS,
by T. Nishiyama. 20 June 61, 44p. incl. illus. 19 refs. (Technical note no. 12)
(Contract AF 61(052)337)
(AFOSR 1440) Unclassified report

DESCRIPTORS: (*Green's function for Electrons and Ions in Gas ionization, *Superconductors, Phonons, Plasma oscillations.) (Operators (Mathematics), Transformations (Mathematics), Complex variables, Fourier analysis, Integral equations.)

Starting with the Bardeen and Pines Hamiltonian for metals, the screening effect of the electron-ion interaction and the change of frequency of the ionic oscillation in superconductors have been considered by introducing a Hartree field in place of the pairing interaction of Cooper. Use is made of the method of thermal Green's functions which affords us analytically tractable results. A method has been proposed to determine a number of parameters involved in the Hartree field in a self-consistent way. (Author)

AD-264 836 Div. 25, 15
(TIPSP/MFA) OTS price $2.60

Washington U., St. Louis, Mo.
POLARIZATION OF SPIN ONE PARTICLES SCATTERED FROM SPIN ZERO NUCLEI,
by Jerome Wesolowski. Aug 61, 25p. incl. illus. (Technical rept. no. 2)
(Contract AF 49(638)843, Proj. 9751)
(AFOSR 1346) Unclassified report

DESCRIPTORS: (*Polarization of *Nuclear spins in *Particles, Deuterons, Scattering.) (Laboratory equipment, Cyclotrons, Cyclotron targets, Helium bombardment.) (Equations, Trigonometry, Algebraic geometry, Integration.)

This discussion is two-fold; first, it is to summarize the theoretical work concerning the polarization of spin one particles scattered from spin zero nuclei; second, it is to explicitly relate the theoretical formulas to possible double scattering experiments. The discussion will clarify and expand partially upon the work of Stapp (Phys. Rev. 107:607, 1957, AD-75 724), who derives the theoretical formula for the differential cross section of a spin one particle twice scattered from a relatively heavy spin zero nucleus. (Author)

AD-264 840 Div. 25
(TIPSP/MFA) OTS price $1.60

Vienna U. (Austria).
ON THE PARITY NONCONSERVATION INDUCED BY THE UNIVERSAL FERMI INTERACTIONS INTO THE PION-NUCLEON VERTEX,
by D. Flamm and P. G. O. Freund. 10 May 61, 12p. illus. (Scientific note no. 9)
(Contract AF 61(052)265)
(AFOSR 854) Unclassified report

DESCRIPTORS: (*Nuclear reactions in *Pions and *Nucleons, Nuclear physics, Theory, Nuclear energy.) (Functions, Equations, Integral equations, Perturbation theory, Integration.)

The problem whether the interpretation of strong interactions as high energy effects of the Universal Fermi Interactions (UFI) is consistent with experimental evidence on parity conservation in low energy nuclear physics is investigated. The parity non-conserving part of the one nucleon off shell pi-N vertex, which originates in the UFI (which we consider smeared out with a heavy vector boson of such a mass, that they bind an extreme relativistic nucleon - anti-nucleon pair into a pion) of the nucleons, is evaluated using dispersion methods and is found to have a relative magnitude of order 1/100,000 10-5 when compared with the parity conserving part. This yields a parity non-conserving pi-N scattering amplitude of the same relative order of magnitude, a result which does not contradict the existing experimental data. (Author)

AD-264 847 Div. 25
(TIPSP/MFA) OTS price $1.10

Athens U. (Greece).
MOMENTUM OF ELECTRONS IN SOLIDS.
Annual technical rept. 1 Sep 60-1 Sep 61,
by K. D. Alexopoulos. 1 Sep 61, 5p. incl. illus.
(Contract DA 91-591-EUC-1557)
Unclassified report

DESCRIPTORS: (*X rays, *Compton effect, Electron beams, Compton scattering, *Electrons, Photons, Motion, Crystal structure.) (Electron tubes, X-ray spectrometers, Doppler systems, Photographic plate, Scintillation counters, Metals, Gases, *Solids.)

Free electrons inside a metal in a continuous movement are studied. This movement of the electrons colliding with the photons causes Doppler effect which has as a result a broadening of the Compton scattering. The profile of the Compton band is a function of the momentum distribution of the electrons contributing to the scattering. The study of this profile presents the most direct method for the investigation of the momentum distribution. (Author)

AD-264 866 Div. 25, 2
(TIPSP/MFA) OTS price $1.60

Cambridge Language Research Unit (Gt. Brit.).
SELF ORGANIZING MECHANISMS AS MODELS FOR SCIENTIFIC THEORIES.
Technical note on Research on Information Structures,
by E. W. Bastin and K. Sparck Jones. 20 July 61, 14p. incl. illus.
(Contract AF 61(052)331)
(AFOSR-1442) Unclassified report

DESCRIPTORS: (*Information theory of *Servomechanisms in *Astrophysics.) (Mathematical analysis, Algebraic geometry, Calculus of variations.) (Quantum mechanics, Galaxies, Planets, Mars.) (Electronic equipment, Thermostats, Analog computer, Tanks, Circuits, Wiring diagrams.)

The current state of theoretical physics makes it urgently desirable to develop a theory which is initially non-metrical for the discussion of problems that arise on the very large and on the very small scale, and from which metrical physics can be deduced as a special case. It is shown that the idea of control is inherently capable of providing a calculus into which basic physical concepts can be incorporated which has the required initially non-metrical properties. The physical

ideas that replace the cartesian assumption are derived from the properties of a self-organizing mechanism, and this application of the principles of self-organizing mechanisms suggests others in more general fields. (Author)

AD-264 878 Div. 25, 14, 4
(TIPSM/SEB) OTS price $8.60

Northwestern Technological Inst., Evanston, Ill.
RESEARCH.
Annual rept. no. 1.
July 61, 92p. incl. illus. tables.
(Contract SD-67)
Unclassified report

DESCRIPTORS: (*Materials, *Scientific research, *Research program administration.) (*Solid state physics, Chemistry, Solids, Metals, Alloys, *Polymers, *Crystals, *Semiconductors, *Phosphors, Clays, Surfaces, *Magnetic materials, Complex compounds, Thin films, Single crystals, Crystal phosphors.) (Preparation, Synthesis, Tests, Mechanical properties, Physical properties, Electrical properties, Optics, Nuclear physics, Radiation effects, Analysis, Theory, Surface properties, Thermodynamics, Structures.)

Contents: X-ray studies of defects in solids; Optical and electrical properties of compound semiconductors; Ultra thin layers of metal single crystals; Fermi surfaces in metals; Interferometry of dimensional changes in solids; Semiconducting gray tin; Work function phenomena and dislocations in solids; Compounds with Ge double bonds and Si transition metal bonds; Microwave investigations of semiconductors and magnetic materials; Rheology of polymers; Synthesis and solid state reactions of metal complexes; Structure and the strength properties of clays; Interaction of imperfections and the deformation mechanism; Lattice imperfections related to mechanical and physical properties; Lattice imperfections produced by electron irradiation, quenching, and low-temperature deformation; Surface chemistry of metals and oxides; Stress distribution in visco-elastic media--thermal stress problems; Low-temperature specific heats of alloy phases; Rate studies of very rapid chemical and physical processes; and Phonon bombardment and the conductivity and photoconductivity of crystal phosphors.

AD-264 879 Div. 25, 4
(TIPSP/MFA) OTS price $3.60

Washington Square Coll., New York U., N. Y.
RESEARCH ON SOLID STATE RADIATION-INDUCED PHENOMENA.
Quarterly rept. no. 6, 1 May-31 July 61,
by Hartmut Kallmann. Aug 61, 34p. incl. illus.
(Contract DA 36-039-sc-85126)
Unclassified report

DESCRIPTORS: (*Solid state physics of Crystal structure in Organic compounds and Chemical reactions by *Induced radioactivity, X rays, Ultraviolet radiation, Fluorescence, Chemical impurities.) (Thermodynamics, Conductivity, Polarization, Luminescence.) (Instrumentation, Scintillation counters.) Tables.

Fluorescent Solutions with Short Decay Times: The fluorescence decay times in solution of four substituted p-oligo-phenylenes are reported. The times are found to be shorter than those of other efficient scintillator solutes. Preparation of Organic Mixed Crystals: Mixed crystals were prepared by the Bridgman method. Several clear or almost clear crystals with less than 0.5 weight percent initial dosage of guest substances were obtained for each combination. Distributions of concentrations in the mixed crystals are not homogeneous but increase gradually from the bottom to the top. The middle parts have almost homogeneous concentration but their values are much less than average concentrations. Emission spectra were measured on anthracene-in-naphthalene crystals of various concentrations. Simultaneous Luminescence and Impedance Measurements of ZnS Phosphors under Illumination with X-Rays: Conductivity and light experiments have been continued on two ZnS phosphors, one activated with copper, the other with silver. In addition, conductivity and light experiments have been carried out on a CaF2 phosphor. (Author)

AD-264 882 Div. 25, 12, 9
(TIPSP/WH) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
MEASUREMENT AND EMPIRICAL CORRELATION OF TRANSPIRATION-COOLING PARAMETERS ON A 25-DEGREE CONE IN A TURBULENT BOUNDARY LAYER IN BOTH FREE FLIGHT AND A HOT-GAS JET,
by Thomas E. Walton, Jr. and Bernard Rashis.
Oct 61, 31p. incl. illus. (Technical note D-967)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note D-967.

DESCRIPTORS: (Aerodynamic configurations, *Conical bodies, Turbulent boundary layer, *Heat transfer, *Cooling, Hydrogen, *Coolants.) (Tests, High temperature research, Flight testing.)

Transpiration-cooling parameters are presented for a turbulent boundary layer on a cone configuration with a total angle of 25 degrees which was tested in both free flight and in an ethylene-heated high-temperature jet at a Mach number of 2.0. The flight-tested cone was flown to a maximum Mach number of 4.08 and the jet tests were conducted at stagnation temperatures ranging from 937 to 1,850 R. In general, the experimental heat transfer was in good agreement with the theoretical values. Inclusion of the ratio of local stream temperature to wall temperature in the nondimensional flow rate parameter enabled good correlation of both sets of transpiration data. The measured pressure at the forward station coincided with the theoretical pressure over a sharp cone; however, the measured pressure increased with distance from the nose tip. (Author)

AD-264 889 Div. 25, 9
(TIPSP/TL) OTS price $8.60

Institute of Mathematical Sciences, New York U., N. Y.
THE INITIAL VALUE PROBLEM, SOUND PROPAGATION, AND MODELING IN KINETIC THEORY,
by Lawrence Sirovich. 15 Sep 61, 91p. incl. illus. tables (Rept. no. MF-17)
(Contract AF 49(638)1006)
Unclassified report

DESCRIPTORS: (*Sound, Propagation, Diffusion, Helium, Kinetic theory.) (Gases, Molecules,

*Hydrodynamics, Boundary layer, Fluid flow, *Quantum mechanics.) (Analysis, Theory, Relaxation time.) (Functions, Polynomials, *Differential equations, Partial differential equations, Matrix algebra, Mathematical analysis.)

The one dimensional initial value problem of a monatomic single component gas is considered. Using the linearized Boltzmann equation the dispersion relation is studied. In addition to the usual gas dynamic sound waves one finds an infinity of decaying propagating waves. The phenomenon naturally exhibits itself as a sequence of epochs, the last stage of which is hydrodynamic. With reference to the same problem macroscopic equations such as Euler, Navier-Stokes, Burnett, Grad's moments equations, etc., are considered. In addition the recently considered kinetic models of Gross (Phys. Fluids 2:432, (1959)) are applied to the problem. These various formulations are critically analyzed and compared with each other and with the Boltzmann analysis. Lastly, several alternate molecular and macroscopic equations are offered which remedy some of the shortcomings which appear in the above mentioned approximate theories. (Author)

AD-264 891 Div. 25
(TIPSP/WH) OTS price $1.60

Institute for Fluid Dynamics and Applied Mathematics, U. of Maryland College Park.
WAVE MOTION IN A TWO COMPONENT PLASMA WITH ANISOTROPIC PRESSURE,
by R. K. Jaggi. Sep 61, 14p. incl. illus.
(Technical note BN-259)
(Contract AF 18(600)1315)
(AFOSR-1529) Unclassified report

DESCRIPTORS: (*Plasma physics, *Wave transmission, *Electromagnetic waves, Propagation, Attenuation, Magnetohydrodynamics, Tensor analysis.) (Ions, Electrons.)

Results for the propagation of small amplitude waves in a plasma with anisotropic pressure tensor are summarized. It is shown that the anisotropy of the pressure tensor has an appreciable effect on the propagation and decay of waves in a plasma. It is also shown that an anisotropy in the electron pressure can lead to an instability of hydromagnetic waves. (Author)

AD-264 897 Div. 25, 8
(TIPSE/NTM) OTS price $1.10

Minnesota U., Minneapolis.
RESEARCH IN GASEOUS ELECTRONICS.
Final interim rept., 15 Sep 58-1 Sep 61,
by H. J. Oskam. Oct 61, 6p.
(Contract AF 49(638)378, Proj. 9653)
(AFOSR-1462) Unclassified report

DESCRIPTORS: (Electrons, Density, *Plasma physics, *Gas ionization, Molecules, Atoms, Gas discharges, Glow discharges, Rare gases, Ions, Recombination reactions, Spectrographic analysis, Mass spectroscopy.) (Microwave equipment, Measurement, Vacuum systems.)

The purpose of the investigation is a detailed study of basic collision processes in decaying plasmas, through the use of light-spectrometer and mass-spectrometer diagnostics. The report describes work accomplished during the first quarter of the contract. Preliminary light-spectrometer studies have shown the necessity of a stable light source. Tests have indicated that using a 2450 megacycle oscillator to create an electrodeless discharge provides an acceptable source. The construction of the quadrupole mass-spectrometer is nearing completion; final assembly of the apparatus will take place shortly. Special reports on both the light-spectrometer and mass-spectrometer methods have been submitted for approval. (Author)

AD-264 936 Div. 25, 4
(TIPSM/SEB) OTS price $1.10

Illinois Inst. of Tech., Chicago.
STRUCTURE STUDIES OF IMPERFECTIONS IN CRYSTALS.
Final rept.,
by Leonid V. Azaroff. 1 Oct 61, 7p.
(Contract AF 49(638)425)
(AFOSR-1463) Unclassified report

DESCRIPTORS: (*Crystals, *Single crystals, Crystal structure, X-ray diffraction analysis or Determination of Electron mass.) (Diffusion, Chemical impurities, Crystals, Theory.) (Atomic structure, Molecular structure.) (Chemical impurities, Zinc.) (Cadmium compounds, Sulfides.) (Zinc compounds, Oxides.) Silicon.

Two procedures for studying imperfections present in crystals are described. In one, electron density distributions in pure and doped CdS and ZnO crystals were obtained and their differences used to determine the imperfections present. This method was sufficiently sensitive to clearly establish the presence and amount of interstitial zinc atoms in ZnO. This excess zinc atom concentration led to the development of a diffusion theory for binary compounds. The second method makes use of the dynamical theory of x-ray diffraction to interpret intensity variations from single crystals in terms of imperfections present in such crystals. It has been applied successfully to transistor grade Si crystals. (Author)

AD-264 966 Div. 25, 22
(TIPSP/WH) OTS price $4.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
DERIVATION OF EQUATIONS FOR THE STRESSES AND STRAINS IN A CYLINDRICAL VISCOELASTIC CASE-BONDED GRAIN,
by A. S. Elder. July 61, 49p. (BRL Memorandum rept. no. 1359)
(Army Proj. 517-06-002)
Unclassified report

DESCRIPTORS: (*Propellant grains, Cylindrical bodies.) (*Stresses, Mathematical analysis, *Integral equations, Functions, Fourier analysis.) (Plasticity, Elasticity, Mechanical properties, Deformation, Propellant grains, Rocket motors.)

Volterra integral equations governing the stresses and strains in a rocket motor and the enclosed propellant grain are derived. The propellant is considered to be linearly viscoelastic in shear and purely elastic when subjected to hydrostatic pressure. The combined effects of tension, internal pressure, and an eroding inner boundary are considered, with

both body force and acceleration terms omitted from the equations of equilibrium. Dynamic stresses under conditions of plane strain are also considered. The treatment is based on the Fourier transform and the complex modulus in shear. Bessel functions of complex argument are required in the solution. (Author)

AD-264 973 Div. 25, 4
(TIPSP/WH) OTS price $7.60

AeroChem Research Labs., Inc., Princeton, N. J.
GENERATION OF SUPERSONIC DISSOCIATED AND IONIZED NONEQUILIBRIUM STREAMS. ENERGY UTILIZATION AND THE DETERMINATION OF ATOM CONCENTRATIONS,
by Daniel E. Rosner. July 61, 74p. incl. illus. tables, 28 refs. (Technical publication no. 31)
(Contract AF 49(638)300)
(AFOSR-1360) Unclassified report

DESCRIPTORS: (*Hydrogen, Atoms, Density, Determination.) (*Plasma jets, Glow discharges, *Supersonics, Electric discharges, Instrumentation.) (Dissociation, Recombination reactions, Gas ionization.) (Free radicals, Production, Determination.) Thermochemistry.

Three distinct methods to determine atom concentrations in the nonequilibrium supersonic jet of activated N emerging from an unconventional direct current glow discharge are evaluated. The accuracy of each method is discussed and compared, both as to the ability to predict trends as well as absolute values. The first is based on over-all power and pressure measurements alone and is capable only of setting an upper limit to the actual atom concentration. The second is classified as differential catalytic thermometry, and relies on the use of differential thermochemical effects for atom recombination reactions on surfaces as a basis of inferring local atom concentrations in the gas phase. The results of a series of upstream mixing experiments support the view that the catalytic probes respond to the same component of active N that is depleted by chemical reaction with unsaturated hydrocarbon gases (ethylene, propylene), the most likely of these species being ground state N atoms. Finally, measurements of the limiting amounts of HCN produced by the reaction of active N with propylene have been used to estimate the dissociation level in the discharge products. Each of the methods leads to dissociation levels of the order of 1% (by mass) in N. (Author)

AD-265 017 Div. 25, 8
(TIPSP/WH) OTS price $4.60

David Sarnoff Research Center, Princeton, N. J.
INVESTIGATION AND STUDY OF BEAM-PLASMA SUBMILLIMETER GENERATION.
Interim engineering rept. no. 1, 1 May-31 Aug 61,
by M. Glicksman, L. S. Napoli and others.
15 Sep 61, 41p. incl. illus.
(Contract AF 33(616)8278)
Unclassified report

Original contains color plates; all ASTIA reproductions will be in black and white. Original may be seen in ASTIA Hq.

DESCRIPTORS: (Microwaves, *Microwave oscillators, Electron beams, *Plasma physics, *Extremely high frequency.) (*Diodes, Cesium, Electric discharges, Backward wave oscillators, Waveguides, Coaxial cables.)

Previous theoretical and experimental studies showed that microwave power may be generated from the electron beam-plasma interaction. This analysis is concerned with achieving conditions in the plasma which allows microwave power generation on an electron beam traversing the plasma at frequencies above 300 kmc. Theoretical studies show the dependence of power gain on the length and the percent ionization of the plasma. A cesium plasma has been produced in a diode discharge with a density greater than 5 x 10 to the 13th power per cc (electron plasma frequency higher than 63 kmc) and an ionization of 25%. A novel approach to the problem of coupling microwave power to the plasma has been investigated theoretically. (Author)

AD-265 042 Div. 25, 15, 8, 2
(TIPSP/MFA) OTS price $2.60

Detroit U., Mich.
HARTREE-FOCK ATOMIC WAVE FUNCTIONS FOR IONS OF P, S, Cl, AND A.
Final rept.,
by S. J. Czyzak. 1961, 10p. incl. tables, 17 refs.
(Contract Nonr-282000, Proj. NR 046-774)
Unclassified report

DESCRIPTORS: (*Wave analysis for *Ions of Chemical elements, Phosphorus, Sulfur, Chlorine, Argon, Nebulae, Atomic structure, Atomic spectrum.) (Ionization, Atoms, Electrons, Chemical properties.) (Computers, Programming, Mathematical prediction, Probability.) (Equations, Integral equations, Differential equations.) Tables.

Hartree-Fock wave functions have been calculated and tabulated for PI to PIV, $S^{=}$ to SV, Cl^{-} to ClVI, and AI to AVII. The mean radii $\bar{r}$, $\bar{r}^2$, the screening constant σ, and the energy parameters $\epsilon_{\alpha\alpha}$ are also tabulated. (Author)

AD-265 057 Div. 25, 27
(TIPSP/JW) OTS price $1.60

Aerojet-General Corp., Azusa, Calif.
EXPERIMENTAL STUDIES ON HEAT TRANSFER AND FLUID FLOW,
by E. L. Geery, L. Green, Jr., and K. L. Nall.
Aug 58, 19p. incl. illus. (Aerojet rept. no. 0140-05-2, vol. 2)
(Contract AF 33(616)5552)
(WADC TN 58-207) Unclassified report

DESCRIPTORS: (*Supersonic nozzles, Diffusion.) (Supersonic flow, Boundary layer, Boundary layer control, Separation, Supersonic nozzles and Sweat cooling.) (Jets, Nozzles in *Heat transfer, Cooling, *Cryogenics, Fluids, Fluid flow and Convection.) Spark shadowgraph photography.

The two-dimensional-nozzle flow experiments indicated that the porous-wall injection technique may be successfully applied for control of wall temperature and for promotion of flow separation. Water-checkout tests of the instrumentation for the study of heat transfer to a flow of fluid in the critical region was initiated. Spark photographs were made of the flow. (Author)

AD-265 063 Div. 25
(TIPSB/MS) OTS price $2.60

Colorado State U., Fort Collins.
STUDIES, RESEARCH AND INVESTIGATIONS OF THE OPTICAL PROPERTIES OF THIN FILMS OF METALS SEMICONDUCTORS AND DIELECTRICS.
Semi-annual rept. no. 3, 13 Aug 60-15 Feb 61.
12 June 61, 22p. incl. illus.
(Contract DA 44-009-eng-3828)
Unclassified report

DESCRIPTORS: (*Thin films, Dielectric films, *Semiconducting films, Metals, *Semiconductors, Dielectrics, Optical materials, *Optics, Measurement.)

The optical constants of cuprous oxide films 590 and 200 Angstroms thich were determined. For the 590 Angstrom film this was done for wavelengths from 1 micron to 5882 Angstroms. The exact thickness of the 200 Angstrom film was determined by selecting the thickness value that yielded the same optical constants at several points as did the thicker film. Using this thickness value, the optical constants were determined for wavelengths from 7700 to 4000 Angstroms. The absorption spectra of several thick Cu20) films at liquid nitrogen temperature was observed. Films on glass, NaCl and KBr were observed. The thicker samples were estimated to be several thousand angstroms thick. In no case was a fine structure corresponding to exciton absorption observed. While each of the films appeared ruby red in transmission as did the very thick Cu20 samples prepared by Misho (1:24), they did not have a sharp absorption edge as did Misho's samples. (Author)

AD-265 064 Div. 25, 26
(TIPSB/MS) OTS price $5.60

Autonetics, Downey, Calif.
A BIBLIOGRAPHY OF X-RAY STUDIES OF ELECTRONIC COMPONENTS,
by Marnelle Kinney. 20 Sep 61, 53p. 166 refs.
(Rept. no. EM-7274)
Unclassified report

DESCRIPTORS: (*Bibliography, *Radiography, *X rays, Electronic equipment, Test methods.) (*Industrial radiography, Industrial research.) (Test equipment, Design, Tests.)

Radiography is used by industry as one of the tools for nondestructive inspection and testing. It is a valuable method because it discloses even minute flaws without impairment of the object. This bibliography of 166 references is arranged alphabetically by title and covers the years 1944 through 1961. An author index and a combined periodical and source index follow the references. (Author)

AD-265 065 Div. 25
(TIPSB/MS) OTS price $1.60

Colorado State U., Fort Collins.
STUDIES, RESEARCH AND INVESTIGATIONS OF THE OPTICAL PROPERTIES OF THIN FILMS OF METALS SEMICONDUCTORS AND DIELECTRICS.
Semi-annual rept. no. 1, 13 Aug 59-15 Feb 60.
15 June 60, 12p. illus.
(Contract DA 44-009-eng-3828)
Unclassified report

DESCRIPTORS: (*Thin films, Dielectric films, Metals, *Semiconducting films, *Semiconductors, Dielectrics, Optics, Optical materials, Measurement.)

AD-265 066 Div. 25
(TIPSB/MS) OTS price $1.10

Colorado State U., Fort Collins.
STUDIES, RESEARCH AND INVESTIGATIONS OF THE OPTICAL PROPERTIES OF THIN FILMS OF METALS, SEMICONDUCTORS AND DIELECTRICS.
Semi-annual rept. no. 2, 16 Feb-12 Aug 60.
12 June 61, 8p.
(Contract DA 44-009-eng-3828)
Unclassified report

DESCRIPTORS: (*Thin films, Dielectric films, *Semiconducting films, *Semiconductors, Dielectrics, Optical materials, *Optics, Measurement.)

AD-265 073 Div. 25, 8, 30
(TIPSP/MFA) OTS price $7.60

Ballistic Research Labs., Aberdeen Proving Ground, Md.
A SPECTRUM ANALYZER FOR ATMOSPHERIC ''WHISTLER'' STUDIES,
by V. R. Colburn and J. E. Cope. Aug 61, 74p. incl. illus. tables (BRL Memorandum rept. no. 1316)
Unclassified report

DESCRIPTORS: (*Radiofrequency spectrum analyzers, *Atmosphere, Radio signals, *Extremely low frequency.) (Instrumentation, Radio equipment, Oscilloscopes, Timing circuits, Magnetic tape, Magnetic recording systems, Wiring diagrams, Photographic recording systems, Recording systems, Amplifiers, Generators.)

A new spectrum analysis system designed around an analyzer operating on a frequency-scan principle is described. The new system is considerably faster than time-scan equipment, being capable of producing comparable spectrum graphs, of good resolution, in only four times original data time. A faster data rate, up to and including real-time, may be obtained with corresponding loss in resolution. An historical background is included, first mentioning earlier whistler studies and then outlining events in the Ballistic Research Laboratories whistler study program which led to the requirement for a faster spectrum analysis system. A detailed description is given of the design and operation of the new spectrum analysis system and sample spectrum graphs made on both the old and the new equipment are reproduced for comparison. (Author)

AD-265 082 Div. 25
(TIPSM/BRW) OTS price $1.60

Brown U. Div. of Applied Mathematics, Providence, R. I.
ON HIGHER RATES OF STRESS AND DEFORMATION,
by William Prager. Sep 61, 12p. (Technical rept. no. 72)
(Contract Nonr-56210, Proj. NR-064-406)
Unclassified report

DESCRIPTORS: (*Stresses, *Deformation, Mechanics, Dynamics, Theory, Mathematical analysis, Equations.) Particles, Acceleration, Velocity.

A variety of definitions of stress rate have been proposed in the literature on mechanics of

continua. Recent work by Prager (Quart. Appl. Math.; 18:403; 1960), Sedov (Prikl. Mat. Mekh.; 14:393; 1960), Naghdi and Wainwright (Quart. Appl. Math.; 19:95, 1961), and Masur (Quart. Appl. Math; 19;160, 1961), has shown that the oldest of these definitions, which is due to Jaumann (Grundlagen der Bewegungslehre der Leipzig, 1905), possesses certain advantages. In the present paper, this definition is extended to the higher rates of stress and deformation and compared to the definitions of these rates that were suggested by Cotter and Rivlin (Quart. Appl. Math.; 13:177, 1955). (Author)

AD-265 101 Div. 25, 9
(TIPSP/TL) OTS price $8.10

Cornell U. Graduate School of Aeronautical Engineering, Ithaca, N. Y.
LINEARIZED OSCILLATIONS IN A PLASMA,
by Gerald Schubert. Sep 61, 82p. incl. illus.
(Contract AF 49(638)544)
(AFOSR 1026) Unclassified report

DESCRIPTORS: (*Magnetohydrodynamics, *Plasma oscillation, *Plasma physics, Ionosphere, Gases, Dynamics, Gas ionization, Fluid flow, Quantum mechanics.) (Electric fields, Magnetic fields, Radio waves, Wave transmission, Propagation, Electromagnetic waves, Microwaves, *Electromagnetic theory.) (Sound, Acoustics, Electrons, Ions, Velocity, Theory, Damping, Vacuum systems, Atoms.) (Algebra, Partial differential equations, Differential equations, Taylor's series, Equations.)

The possible modes of oscillation of a plasma are determined from the linearized equations of the two-fluid model. The linearization is carried out in the presence of a strong steady magnetic field, and only wave propagation normal to the magnetic field is considered. These equations determine the regimes of applicability for the single-fluid equations and the magneto-ionic theory; and both theories are found to be special cases of the general equations. The linearized equations of the single-fluid model are used to investigate the interaction of a low frequency electromagnetic wave with a semi-infinite plasma. The magneto-ionic theory is found to be a special case of the linearized two-fluid equations. (Author)

AD-265 106 Div. 25, 7, 17
(TIPSM/REB) OTS price $1.60

Chrysler Corp., Detroit, Mich.
RESEARCH PROGRAM ON SEMICONDUCTING COMPOUNDS FOR THERMOELECTRIC POWER GENERATION AT HIGH TEMPERATURES.
Bimonthly progress rept. no. 3, 15 Sep-14 Nov 60, by C. R. Lewis. 14 Nov 60, 17p. incl. illus.
(Contract NObs-78664)
Unclassified report

DESCRIPTORS: (*Semiconductors, Refractory materials, Metals, *Intermetallic compounds for *Thermoelectricity, Power supplies.) (Selenides, Tellurides of Tungsten compounds, Tantalum compounds, Hafnium compounds, Rhenium compounds.) (Germanium alloys, Intermetallic compounds with Tantalum alloys, Rhenium alloys.) (Nickel alloys, Intermetallic compounds with Aluminum alloys.) (Bismuth alloys, Intermetallic compounds with Hafnium alloys, Rhenium alloys.) (Antimonides of Hafnium compounds, Tantalum compounds, Rhenium compounds.) Preparation, Electrical properties, Synthesis, High temperature research, *Electric power production.

Samples of WSe2 and WTe2 were prepared. The material resulting from mixing Ta powder and Se in a 1:4 atomic ratio gave a complex X-ray diffraction pattern indicating a TaSe phase of low crystal symmetry. A compound was prepared which is probably a Laves-type phase of nominal composition Ta31Te8. Difficulties were encountered in producing a Ta-Ge compound in sufficient quantity for measurement because of the large increase in volume during the reaction. An unknown phase was indicated in the reaction material from a 1:4-atom-ratio mixture of Hf and Se. A dark powder obtained from an Re-Se sample reacted at 1200 F for 260 hr may have useful properties as a solid lubricant. Results are presented of Seebeck coefficient and resistivity measurements made on NiAl, TaSb, WTe2, and WSe2.

AD-265 113 Div. 25, 8
(TIPSP/WH) OTS price $2.60

Electron Tube and Microwave Lab., Calif. Inst. of Tech., Pasadena.
STUDY OF ELECTROMAGNETIC INTERACTIONS IN PLASMAS.
Quarterly progress rept. no. 6, 1 Apr-30 June 61, by R. W. Gould and D. G. Dow. 30 June 61, 21p. incl. illus.
(Contract DA 36-039-sc-85317)
Unclassified report

DESCRIPTORS: (*Plasma physics, *Plasma oscillations, Electromagnetic waves, Microwaves, Propagation, *Electron beams.) (Plasma physics, Cesium, Cesium compounds, *Magnetohydrodynamics.) Scattering.

The interaction of an electron beam with an infinite plasma has been studied theoretically, examining both the longitudinal and transverse waves. It is shown that even for arbitrary angle between the direction of propagation and the electron beam, the two wave types are approximately decoupled. Expressions and curves for the propagation constants and growth rates are given for several interesting special cases. Results of a preliminary experiment to study diffusion of a cesium plasma across a magnetic field suggest that electron loss is the determining factor in the loss rate. (Author)

AD-265 116 Div. 25
(TIPSM/BRW) OTS price $2.60

Institute of Engineering Research, U. of Calif. Berkeley.
ON SOME INTEGRAL THEOREMS FOR ELASTIC BODIES WITH INCOMPATIBLE STRAINS,
by C. S. Hsu. Sep 61, 23p. 12 refs. (Technical rept. no. 14; Series no. 131, Issue no. 14)
(Contract Nonr-22269, Proj. NR-064-436)
Unclassified report

DESCRIPTORS: (Deformation, *Stresses, *Elasticity, *Integrals, Thermal stresses, Boundary layer, Load distribution, Theory, Mathematical analysis, Differential equations.)

The reciprocal theorem of Betti and various variational principles are generalized so as to be applicable to elastic bodies with incompatible strains. Based upon the reciprocal theorem, a number of integral formulas concerning strain and stress can be established. The general formulation of these integral theorems is shown to be applicable to both thermal problems and dislocation problems. (Author)

AD-265 117 Div. 25
(TIPSM/EET) OTS price $2.60

Materials Research Lab., U. of Calif., Berkeley.
THE EFFECT OF TEMPERATURE ON THE YIELD STRENGTH FOR BASAL SLIP IN LITHIUM ALPHA SOLID SOLUTION OF MAGNESIUM SINGLE CRYSTALS,
by R. M. Quimby, J. D. Mote, and J. E. Dorn.
15 July 61, 23p. incl. illus. tables, 13 refs.
(Technical rept. no. 8; Series no. 73, Issue no. 9)
(Contract DA 04-200-507-ORD-171)
(AROD rept. no. 821:8) Unclassified report

DESCRIPTORS: (*Single crystals, Magnesium alloys, Lithium alloys, Deformation, Stresses, Shear stresses.) (Crystals, Crystal structure, Grains (Metallurgy), Lattices, X-ray spectroscopy, Deformation, Hardening, Tensile properties, Mechanical properties, Temperature.)

An investigation was conducted on the deformation of single crystals of alpha solid solution (12.5 at-% Li in Mg) specially oriented for basal slip. Crystals were tested in tension over the range of temperatures between 77 and 645 K. The alloy has a critical resolved shear-stress at least ten times that of pure Mg. Whereas the critical resolved shear-stress was temperature dependent below 250 K, it was relatively constant over the higher temperature range. Above 400 K all crystals fractured on the prismatic planes following duplex prismatic slip. Twinning, kinking and accommodation bending was observed in areas adjacent to subgrain boundaries and the shear-stress vs shear-strain curves for the crystals were correlated with the various types of deformation markings observed on the surfaces of the strain specimens. The thermally activated deformation mechanism below 250 K probably arises from the dislocation intersection process whereas the higher temperature athermal behavior is thought to be a result of short-range ordering. (Author)

AD-265 121 Div. 25, 8
(TIPSM/EET) OTS price $2.60

Compagnie Generale de Telegraphie Sans Fil (France).
PREPARATION AND PROPERTIES OF THERMOELECTRIC MATERIALS.
Final rept. 1 Aug 60-30 Sep 61,
by H. Guennoc. Sep 61, 25p. incl. illus. tables.
(Contract DA 91-591-EUC-1505)
Unclassified report

DESCRIPTORS: (Semiconductors, *Thermoelectricity, *Materials, Intermetallic compounds of Molybdenum compounds or Tungsten compounds, Tellurides and Selenides, Preparation, Synthesis.) (Single crystals, Chemical reactions, Lattices, Electrical properties, Physical properties, Hall effect, Thermal conductivity, Measurement.)

Three methods of preparation of Mo and W tellurides were tried; only one of them, named preparation by chemical transport reactions, has been successfully used to yield small single crystals. The stability of these compounds is discussed and indications are given on the sintering process used to prepare barretts to allow electrical and thermal measurements. The lattice constants of MoTe2 and the optical energy gap were determined using small single crystals. Results are also available on the resistivity, Seebeck coefficient and diffusivity of MoTe2 and alloys of MoTe2 and WTe2. (Author)

AD-265 147 Div. 25, 7, 17
(TIPSM/REB) OTS price $4.60

Battelle Memorial Inst., Columbus, Ohio.
THERMOELECTRIC POWER GENERATION AND RELATED PHENOMENA.
Final rept., 24 Apr 59-7 Mar 61,
by T. S. Shilliday. 15 May 61, 46p. incl. illus. table, 28 refs.
(Contract NObs-77034)
Unclassified report

DESCRIPTORS: (Materials, *Intermetallic compounds, Semiconductors, *Thermoelectricity, Power supplies.) (Arsenides, Aluminum compounds, Gallium compounds.) (Alloys, Arsenides, Antimonides, Phosphides.) (Gallium compounds, Antimonides, Phosphides.) (*Thermal diffusion, Measurement, Theory, Test equipment.) (Indium compounds, Antimonides.) (Gallium compounds, Arsenides.) Germanium, Electrical properties, Resistance, Hall effect, Preparation, Heat treatment.

Sound, single-phase, solid solutions of the pseudo-binary system GaAs-AlAs were prepared by zone-leveling and solute-buildup techniques. Study of this system has been confined largely to the low Al region. The thermoelectric power of n-type GaAs is increased and the thermal conductivity is decreased by alloying with AlAs. The room-temperature thermoelectric power in material with about 3 x 10 to the 18th power electrons/cc increased from 63.4 to 176.2 microvolts/deg C (0 to 22.3 mole-% AlAs), whereas the thermal conductivity decreased from 0.39 to 0.15 w/cm C. On the other hand, in all cases, alloying has resulted in rather high room-temperature resistivities. A description of both the theory and the apparatus design of the method for measuring thermal diffusivity is given. (Author)

AD-265 149 Div. 25, 7, 17
(TIPSM/REB) OTS price $1.10

Electro-Optical Systems, Inc., Pasadena, Calif.
HIGH TEMPERATURE SEMICONDUCTING COMPOUNDS FOR THERMOELECTRIC POWER GENERATION.
Bi-monthly progress rept. no. 1, 15 Dec 60-15 Feb 61,
by C. Leung. 15 Feb 61, 6p. incl. tables, 13 refs. (EOS rept. no. 1592-2M-1)
(Contract NObs-84327)
Unclassified report

DESCRIPTORS: (Materials, *Semiconductors, *Intermetallic compounds, *Thermoelectricity, Power supplies.) (*Uranium compounds, *Thorium compounds, Sulfides, Selenides, Tellurides, Electrical properties, Resistance, Melting, Electrical conductance, Density, Heat of formation.)

A search is being made for high temperature semiconducting compounds for thermoelectric power generation. Systems to be studied include, but are not necessarily limited to, combinations of U and/or Th with S, Se and/or Te. (Author)

AD-265 176 Div. 25, 17
(TIPSM/BRW) OTS price $5.60

Illinois U. Engineering Experiment Station, Urbana.
CREEP TORSION OF NON-CIRCULAR BARS,
by John L. Gubser and Omar M. Sidebottom.

Aug 61, 54p. incl. illus. tables, 30 refs.
(T&AM rept. no. 198)
Unclassified report

DESCRIPTORS: (Mechanics, Creep, Torque, *Rods, Theory, Tests.) (Theory, Elasticity, Plasticity, Stresses, Deformation, Physical properties, Mechanical properties, Equations, Mathematical analysis.) (Test methods, Ethylenes, Polymers, Controlled atmospheres.)

The report is a theoretical and experimental investigation of the creep-torsion of non-circular prismatic bars. The theory is developed using an energy approach and assumes the material is homogeneous, isotropic and incompressible, the deformations are small and the total theory is valid. An isochronous stress-strain diagram, which is approximated by an arc hyperbolic sine function, is used to represent the stress-strain-time relation for the material. As a closed solution could not be obtained, the Rayleigh-Ritz procedure was used. Experimental data was obtained by applying a pure torque to specimens of high density polyethylene. Four cross-sectional shapes were tested, a square, a rectangle, a triangle and an I-section. The theory and experiment in most cases were in good agreement. (Author)

AD-265 204 Div. 25, 17
(TIPSM/BRW) OTS price $4.60

Ordnance Materials Research Office, Watertown, Mass.
HIGH LOADING RATES IN METALS,
by R. Beeuwkes, Jr. June 59, 42p. incl. illus.
(MRL rept. no. 64)
(Proj. TB 4-001 and DA 5-93-32-001)
Unclassified report

DESCRIPTORS: (*Mechanics, *Metals, Alloys, Ordnance steel, Gun barrels, Load distribution, Velocity, Plasticity, Deformation, Stresses, Mechanical properties, Tensile properties, Fracture (Mechanics), Fatigue (Mechanics), Impact shock, Hardness, Terminal ballistics, Test methods, Tests, Analysis.) Photoelastic materials.

High loading rate effects are found to commonly occur in both low and high speed apparatus and tests. Though commonly disregarded, it is important to understand these effects as shown by examples which also indicate how low speed tests may often be satisfactorily substituted for high speed tests. The severity of rates, judged by materials behavior which is considered the outstanding criterion, is found to be crucially dependent on temperature. (Author)

AD-265 206 Div. 25, 17
(TIPSP/WH) OTS price $3.60

Aeroelastic and Structures Research Lab., Mass. Inst. of Tech., Cambridge.
THE TRANSVERSE DEFORMATION OF DOUBLE BEAMS.
by C. G. B. Mitchell. Sep 61, 33p. incl. illus.
(Rept. no. TR 100-1)
(Contract AF 49(638)985, Proj. 9782)
(AFOSR-1477) Unclassified report

DESCRIPTORS: (*Beams, *Deformation, Deflection, *Stresses, Analysis, Elasticity, Impact shock, Load distribution.) (Mathematical analysis, Motion.)

The response is analyzed of double beams to impulsive loads when the beams are joined together at either end and the pair is simply supported. The material of the two beams is assumed to exhibit rigid-plastic behavior. It is found that the effect of the end loads induced in the beams by their deformations have a comparatively small effect on the motions and final displacements of the two beams. Graphs are included to enable a particular system to be analyzed with a minimum of effort. (Author)

AD-265 216 Div. 25, 27
(TIPSM/BRW) OTS price $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
PLASTIC INSTABILITY OF CYLINDRICAL PRESSURE VESSELS OF FINITE LENGTH.
Technical rept. on Flight Sciences,
by Pauline Mann-Nachbar and Oscar Hoffman.
Sep 61, 40p. incl. illus. (Rept. no. 6-90-61-100)
Unclassified report

DESCRIPTORS: (Mechanics, *Cylindrical bodies, *Pressure vessels, Structural shells, Plasticity, Stability, Hydrostatic pressure, *Failure (Mechanics), Fracture (Mechanics), Theory, Mathematical analysis, Stresses, Deformation.) Metals, Rocket cases, Solid rocket propellants.

The known solution for the plastic instability failure of an infinite cylindrical shell under internal pressure is extended to shells of finite length. An incremental theory of plasticity is used in the analysis, in conjunction with Tresca's yield condition. It is considered that the shell is made of a rigid plastic material which exhibits strain hardening and obeys Ludwik's power law. The ends of the shell are constrained in such a manner as to prevent radial motion but to permit axial displacements. Membrane theory is used throughout, and restraining moments are considered negligible in the plastic range. Conditions for instability are investigated at the shell's equator. In the analysis, a deformed contour in the shape of a parabola is assumed for the shell's meridian. However, the solution at the equator does not appear to be particularly sensitive to changes in meridian contour. As expected, higher pressures can be obtained in the finite shell, before the onset of instability, than in the infinite shell. (Author)

AD-265 228 Div. 25
(TIPSP/MFA) OTS price $5.60

Minnesota U., Minneapolis.
THE STUDY OF PROCESSES IN GASEOUS PLASMAS WITH THE AID OF A DRIFT-VELOCITY SPECTROMETER,
by J. M. Madson and H. J. Oskam. July 61, 52p. incl. illus.
(Contract AF 49(638)378, Proj. 9768)
(AFOSR-1395) Unclassified report

DESCRIPTORS: (Processing, *Gas ionization, Gases, *Plasma physics, Drift, Velocity, *Beta ray spectrometers.) (Quantum mechanics, Molecular structure, Particles, Ion exchange, Exchange reactions, Resonance, Electric fields, Diffusion, Vacuum systems, Helium.)

The construction of a drift-velocity spectrometer developed for the measurement of the mobility of positive ions produced in steady state and pulsed gaseous discharges is described. The ions are extracted from the gaseous plasma via a gating system and the time needed to traverse the drift region under the influence of a known electric field is measured. A short survey of the various methods used for the calculation of the ion mobility values is included. Preliminary measurements in helium of the value

of the mobility of atomic and molecular helium ions gave the following results: (a) The value for the mobility of He(+) in helium is in excellent agreement with that obtained by other research groups. (b) The value for the mobility of He2(+) in helium is considerably smaller at low E/Po (electric-field-gas pressure ratio) than found by others and seems to be close to the value derived from microwave studies of disintegrating gaseous plasmas. (Author)

AD-265 280 Div. 25, 8
(TIPSP/MFA) OTS price $10.10

David Sarnoff Research Center, Princeton, N. J.
MAXIMIZING THE PERFORMANCE OF PHOTOCONDUCTORS.
Scientific rept. no. 1, 15 Mar-15 Sep 61,
by W. M. Anderson, J. Blanc and others.
14 Sep 61, 123p.
(Contract AF 19(604)8353)
(AFCRL-789) Unclassified report

DESCRIPTORS: (*Photoconductivity in *Cadmium compounds, Crystals, Crystal structure, Thermal conductivity, Hall effect, Dielectrics, Sensitivity, Electrons, Electron capture, Electrodes, Photons, Excitation, Ionization.) Sublimation. (Laboratory equipment, Laboratory furnaces, Electron tubes, Spectrographic analysis.) (Photographs, Tables.)

Crystals of CdS have been grown both by sublimation techniques and by chemical transport. Still larger crystals are being grown by a combination of these techniques with a moving temperature gradient. Crystals grown by sublimation show potentialities of being quite pure, and trap densities have been obtained without special purity precautions. CuS has been found to co-transport with CdS, and this phenomenon has been used to grow CdS:I:Cu crystals with a higher concentration of Cu than has previously been reported in single crystals. Such crystals may be prepared to show improved performance for low light excitations. The dependence of hole ionization energy of sensitizing centers on impurity concentration in these crystals is of fundamental significance in the problem of impurity interaction. The properties of large CdS crystals grown by Eagle Picher have been examined. The existence of a high-conductivity storage state at low temperatures has been investigated further. The effects of sulfur annealing and copper diffusion in making initially high-conductivity spectrographically pure CdS into low-conductivity crystals with photosensitivity are examined. (Author)

AD-265 301 Div. 25, 8
(TIPSP/WH) OTS price $6.60

Stanford Electronics Labs., Stanford U., Calif.
PARAXIAL SOLUTIONS FOR DECELERATED AXIALLY SYMMETRIC SPACE-CHARGE FLOW.,
Final rept.,
by R. P. Borghi. 30 Mar 61, 61p. incl. illus.
(Technical rept. no. 102-3)
(Contract AF 33(616)6207)
Unclassified report

DESCRIPTORS: (*Electron beams, Particle trajectories, Optics, Space charges, Axially symmetric flow, Analog computers, Deceleration.) (Mathematical analysis, Equations, Series.) Electric potential.

Solutions for space-charge-flow based on the well known axially symmetric paraxial approximation are presented. This permits, under a unified heading, some new solutions plus restatements and extensions of results previously appearing in separate contexts. In addition to the well known Universal Beam Spread Curve, solutions for linear, parabolic, and sinusoidal axial potential variations are obtained. The axial potential variation is solved for producing specified hyperbolic and parabolic beam trajectories. Following the trajectories and axial potentials obtained from the paraxial ray equation, representative approximate solutions are presented for the potentials within and outside the beam. These are obtained over limited regions by use of series expansions similar to those used in obtaining the paraxial approximation. The scale of the potential variations and trajectories were chosen primarily to show beam spreading in cases for which the space-charge forces are important and the beam potential is significantly depressed. This study had as a background the investigation of the axially symmetric depressed collector. (Author)

AD-265 334 Div. 25, 4
(TIPSM/EJH) OTS price $1.10

Institute of Optics, U. of Rochester, N. Y.
INVESTIGATIONS OF THE OPTICAL DETECTION OF HYPERFINE RESONANCES IN ALKALI VAPORS.
Quarterly progress rept. no. 1, 15 May-15 Aug 61,
by C. O. Alley. 15 Aug 61, 7p.
(Contract DA 36-039-sc-87273, Proj. 3A99-15-001)
Unclassified report

DESCRIPTORS: (*Alkali metals, *Rubidium, Atoms, Vapors, *Hyperfine structures, Nuclear spins, Relaxation time, Atomic energy levels, Detection by Optics.) (Test equipment, Discharge tubes, Coatings, Ethyl radicals, Silanes.) Optical equipment.

The results of some free-precession experiments on the T sub 2 relaxation times of optically oriented Rb atoms contained in bulbs whose walls are coated with alkyl groups resulting from treatment with alkylchlorosilanes are presented. A 1-in.-diam cell coated with ethyl groups gave T sub 2 equals to 65 x 10 to the -3rd power sec. Digital computer investigations in progress on optical pumping dynamics under a variety of conditions of illumination and relaxation are described. Instrumentation for more detailed investigation of spin relaxation in optically oriented rubidium vapor is mentioned. (Author)

AD-265 353 Div. 25, 17
(TIPSM/BRW) OTS price $1.60

Syracuse U., N. Y.
CRACK INITIATION IN METALLIC MATERIALS.
Quarterly progress rept. no. 1, 1 May-1 Aug 61,
by Volker Weiss and John G. Sessler. Aug 61,
11p. incl. illus. 15 refs. (Rept. no. MET878-618P1)
(Contract NOw 61-0710-d)
Unclassified report

DESCRIPTORS: (*Fracture (Mechanics), Metals, Stresses, Deformation, Propagation, Grains (Metallurgy), Metallurgical analysis, X-ray diffraction analysis, Tests.) Tungsten, Crystallization, Materials.

The study is aimed at correlating the fundamental properties of materials obtainable from tensile, bend, combined stress state tests and metallographic and X-ray diffraction studies to the initiation of fracture in the presence of a notch or a crack. The experimental program will therefore consist of two phases (which can be conducted simultaneously); (1) study of the fundamental properties, and (2) fracture initia-

tion studies in the presence of notches and cracks. Both phases will be conducted on high purity W recrystallized to several grain sizes and tested at various temperatures to study the effects of ductility. (Author)

AD-265 403 Div. 25
(TIPSM/SEB) OTS price $2.60

Honeywell Research Center, Hopkins, Minn.
THE SODIUM CHLORIDE-SILVER CHLORIDE ALLOY SYSTEM,
by R. J. Stokes and C. H. Li. Oct 61, 28p. incl. illus. 11 refs. (Technical rept. no. 14; Rept. no HR-61-260)
(Contract Nonr-245600, Proj. NR-032-451)
Unclassified report

DESCRIPTORS: (Alloys of *Chlorides of *Sodium compounds and *Silver compounds.) (Crystals, *Single crystals, Heat treatment, Mechanical properties, Physical properties.) (Crystal structure, Lattices, Deflection, Deformation.)

A miscibility gap exists in solid solutions between NaCl and AgCl. At room temperature the two phase region extends from 10% NaCl to 80% NaCl. The precipitation reaction reaction leads to a change in the appearance of single crystals from complete transparency to a milky white opaqueness. Measurements of room temperature mechanical properties have shown a tremendous (100 fold) increase in strength within the two phase region with a slight increase in the rate of work hardening. The transition in slip mode from the coarse wavy slip of silver chloride to the fine straight slip of sodium chloride is found to occur gradually across the diagram. (Author)

AD-265 417 Div. 25
(TIPSP/MFA) OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
A METHOD FOR THE RAPID NUMERICAL SOLUTION OF THE HEAT CONDUCTION EQUATIONS FOR ENERGY ABSORBED BY A SEMI-INFINITE SOLID HEATED BY A VARYING SURFACE TEMPERATURE AT x=0,
by John D. Ferguson. 1 Mar 61, 9p. incl. tables.
(NAVWEPS rept. 7397) Unclassified report

DESCRIPTORS: (Numerical analysis of *Thermal conductivity, Equations for Energy by *Solids, Heat transfer, *Surface temperatures, Tables, Diffusion.) (Functions, Integrals, Partial differential equations, Polynomials, Difference equations.)

A rapid numerical scheme is presented for obtaining the energy absorbed per unit of area, q, through the surface of a semi-infinite solid, where the surface temperature is given as a function of time. A simple numerical scheme is used to evaluate the integral which defines q in terms of the surface temperature. Average values of the surface temperature are used in each time interval of the grid which partitions the time axis. This method eliminates the necessity of computing the rate at which energy is transferred to the solid and/or the interior temperatures of the solid. (Author)

AD-265 419 Div. 25, 30
(TIPSM/BRW) OTS price $.50

Naval Research Lab., Washington, D. C.
HIGH-TEMRERATURE FATIGUE IN CONTROLLED ENVIRONMENTS,
by G. J. Danek, Jr., H. H. Smith, and M. R. Achter. 8 Sep 61, 14p. incl. illus. tables.
(NRL Rept. no. 5666)
Unclassified report

DESCRIPTORS: (High temperature research, *Fatigue (Mechanics), Controlled atmospheres, Air, Vacuum systems, Nickel, Stainless steel, Nickel alloys, Chromium alloys, Test equipment.)

The effect of environment on the high-temperature fatigue properties of nickel, Type 316 stainless steel, and Inconel X was investigated by comparing the fatigue life in air to that in vacuum at 1500 F. Sheet-metal specimens of these materials were cycled in reverse bending at their resonant frequency by means of equipment developed to perform high-temperature fatigue tests in controlled environments. The effect of environment on fatigue properties is similar for all three materials. At high strains fatigue lives are superior in vacuum; with decreasing strain the vacuum and air curves converge. These results can be explained by a mechanism previously proposed to interpret similar findings in creep. This mechanism involves the simultaneous operation of two competing processes: the surface adsorption of gaseous impurities lowers the surface energy and facilitates crack propagation, while oxidation provides a strengthening tendency. (Author)

AD-265 444 Div. 25
(TIPSM/EJH) OTS price $1.60

Massachusetts U., Amherst.
THE EFFECT OF A DISTRIBUTION OF SIZES ON THE LIGHT SCATTERING PATTERNS FOR SPHERES,
by R. S. Stein, S. N. Stidham, and P. R. Wilson. 10 Aug 61, 16p. incl. illus.
(Contract Nonr-335700)
(ONR Technical rept. no. 36)
Unclassified report

DESCRIPTORS: (*Light, Scattering, *Propagation, Polarization, *Spheres, *Particles, Cylindrical bodies, Polymers, Theory, Mathematical analysis, Programming.)

The light scattering patterns for anisotropic spheres have been described, and scattering patterns calculated as a function of sphere radius, principal polarizabilities, and polarizabilities of surroundings. These calculations are intended to represent idealizations of spherulitic polymers in which all spheres are not of equal size, but in which a distribution of spherulitic sizes occurs. It is the purpose of this paper to evaluate numerically the effect of such distributions upon the scattering patterns. (Author)

AD-265 445 Div. 25
(TIPSM/SEB) OTS price $1.60

Colorado State U., Fort Collins.
STUDIES, RESEARCH AND INVESTIGATIONS OF THE OPTICAL PROPERTIES OF THIN FILMS OF METALS SEMI-CONDUCTORS AND DIELECTRICS.
Final rept., 16 Feb-12 Aug 59,
by Lawrence N. Hadley. 15 Feb 60, 13p. incl. illus. table.
(Contract DA 44-009-eng-3719)
Unclassified report

DESCRIPTORS: (*Semiconducting films, Dielectrics, Films, *Thin films, *Titanium compounds, Dioxides, Optics, Measurement.) (Spectrophotometers, Optical filters, Ultraviolet filters, Coatings, Alkali metals, Potassium, Preparation.)

The optical constants of rutile, TiO2, in the visible and ultraviolet were studied. Several improvements have been made in apparatus and techniques. Chief among these is the construction of a vacuum system with a 6 in. oil diffusion pump and in 18 in. diameter bell jar. Minor improvements have been made in the optical system. The net result of these improvements has not yet led to any significant difference in the values for optical constants of rutile from those previously reported. Time has been devoted to the development of alkali metal filters for use in the ultraviolet. (Author)

AD-265 446 Div. 25
(TIPSP/MFA) OTS price $1.10

Free U., Berlin (Germany).
THEORETICAL RESEARCH STUDIES OF REACTING PLASMAS.
Final rept., 1 June 59-15 July 61,
by Gunther Ludwig. 15 July 61, 6p.
(Contract AF 61(052)239)
(AFOSR-1441) Unclassified report

DESCRIPTORS: (*Plasma physics, *Quantum mechanics, Kinetic theory, Gases, Particles.) (Statistical processes, Statistical distributions, Probability.)

A theoretical study is presented for the derivation of a generalized application of the Boltzmann equation to the time evolution of plasmas. The concept is based upon the kinetic theory of gases which was extended through the use of statistical methods to measurements of particle probability densities.

AD-265 454 Div. 25, 9
(TIPSP/MFA) OTS price $7.60

AVCO Research Lab., Everett, Mass.
SHOCK WAVES IN COLLISION-FREE PLASMAS,
by M. Camac, A. R. Kantrowitz and others.
Aug 61, 67p. incl. illus. 36 refs. (Research rept. no. 107)
(Contract AF 49(638)61 and Nonr-252400)
(AFOSR-1173) Unclassified report

Presented at International Atomic Energy Meeting Salzburg, Austria, September 4-8, 1961.

DESCRIPTORS: (Plasma physics, *Shock waves, *Plasma oscillations, Gas ionization, Magnetohydrodynamics, Magnetic fields, Heat transfer, Attenuation.) (Laboratory equipment, Experimental data, Shock tubes, Gas cylinders, Infrared equipment.) (Kinetic theory, Equations, Taylor's series, Harmonic analysis, Perturbation theory.)

Investigation of the structure of a shock wave provides an excellent opportunity for studying the dissipation processes in collision-free plasmas. The thickness of collision-free shock waves was previously obtained from measurements of the light emitted by the plasma in a magnetic annular shock tube. The magnitude of the shock thickness, and its Mach number and density dependence are in agreement with a theoretical estimate based on the concept that the required dissipation in the shock is produced by nonlinear interactions between magnetohydrodynamic waves. Further confirmation of these results is discussed. (Author)

AD-265 474 Div. 25
(TIPSP/MFA) OTS price $5.60

Massachusetts Inst. of Tech., Cambridge.
SOLID-STATE AND MOLECULAR THEORY GROUP.
Quarterly progress rept. no. 42.
15 Oct 61, 48p. incl. illus. tables.
(Contract Nonr-184134)
Unclassified report

DESCRIPTORS: (*Solid state physics, *Molecular structure, Theory.) (Wave transmission of Electron beams, Electrons, Atomic orbitals, Molecular rotation, Metals, Energy, Scattering, Amplitude modulation, Brillouin zones.) (Equations, Integral equations, Matrix algebra, Integrals, Bessel functions, Green's function.) Tables.

Contents:
On a new method for the calculation of correlated atomic wave functions
Hartree-Fock wave functions for the 4p shell atoms
A configuration interaction study of the electric states of the water molecule
The methane molecule: matrix elements of the Hamiltonian
Evaluation of molecular integrals
Note on reactive scattering in crossed molecular beams
APW energy band calculations
The energy bands and Fermi surface for copper
Structure of d-hump in density of states for copper
Energy bands in nickel oxide by augmented plane wave method
The Fermi surface metallic lithium

AD-265 485 Div. 25, 2, 12
(TIPSP/GW) OTS price $.50

National Aeronautics and Space Administration, Washington, D. C.
THE TIROS II RADIATION EXPERIMENT,
by R. A. Hanel and W. G. Stroud. Oct 61, 8p. incl. illus. table (NASA Technical note no. D-1152)
Unclassified report

Also available from NASA, Wash. 25, D. C., as NASA Technical note no. D-1152.

DESCRIPTORS: (*Meteorological data, Collecting methods by *Satellite vehicles.) (*Blackbody radiation, Infrared radiation, Ultraviolet radiation, Measurement, Recording devices, Radiometers and Television cameras, Airborne.) (Telemetering data, Data transmission systems, Magnetic tape.)

The TIROS II meteorological satellite was placed into orbit on November 23, 1960. It contains two television cameras and equipment for a family of electromagnetic radiation experiments, including a medium resolution radiometer. The medium resolution radiometer is a cluster of five sensors which have their optical axes inclined 45 degrees to the spin axis of the satellite. The spin of TIROS II provides the scanning motion. The five radiometer channels are sensitive to the following spectral bands: 6 to 6.5; 8 to 12; 0.2 to 6; 8 to 30; and 0.55 to 0.75 microns. (Author)

26. PRODUCTION AND MANAGEMENT

AD-264 711 Div. 26, 17
(TIPSM/BRW) OTS price $19.75

General Dynamics/Convair, San Diego, Calif.
TITANIUM DEVELOPMENT PROGRAM. (VOLUME III).
Final technical engineering rept., Dec 57-May 61,
by A. P. Langlois, J. F. Murphy, and E. D. Green.
May 61, 317p. incl. illus. tables.
(Contract AF 33(600)34876)
(ASD TR 61-7-576, vol. 3)
Unclassified report

DESCRIPTORS: (Sheets, *Titanium alloys, Processing, Manufacturing methods, Heat treatment, Deformation, Metal forming brakes, Metal forming presses, Welded joints, Welding, Arc welding, Spot welding, Brazing, Machining, Cleaning, Pickling, Chemical milling, Degasification, Hydrogen.) (*Titanium alloys, Aluminum alloys, Molybdenum alloys, Vanadium alloys.) (*Titanium alloys, Aluminum alloys, Vanadium alloys.) (Titanium alloys, Vanadium alloys, Chromium alloys, Aluminum alloys.) (*Titanium alloys, Aluminum alloys, Chromium alloys, Iron alloys.) Microstructure, Mechanical properties, Tests.

Ti-4Al-3Mo-1V alloy was found to be superior to Ti-2.5Al-16V and Ti-6Al-4V considering the overall forming and joining characteristics determined by the basic fabricability evaluation. In the supplemental evaluation of 2 additional alloys, the Ti-13V-11Cr-3Al was found to be superior to Ti-5Al-2.75Cr-1.25Fe in mechanical property values and spot weld strength characteristics. (Author)

AD-264 786 Div. 26, 17
(TIPSM/DLW) OTS price $2.60

Republic Aviation Corp., Farmingdale, N. Y.
CAPACITOR DISCHARGE METAL FORMING.
Interim technical engineering rept. no. 3,
3 July-3 Oct 61,
by J. Christiana, P. D'Aguanno and others. Oct 61,
15p. incl. illus.
(Contract AF 33(600)42920, Proj. 7-844)
(AMC TR 7-844, vol. 3) Unclassified report

DESCRIPTORS: (*Capacitors, *Electric discharges, *Electroforming, Underwater explosions, Sparks, Shock waves, Pressure, Electromagnetism, Explosive forming, *Metals, *Sheets, Processing, Deformation.) (Capacitors, Switches, Trigger circuits, Power supplies, Control systems, Design.) (Rocket cases, Airframes, Manufacturing methods.)

The design features of a trigger switch for 960 uf 18 kv discharges are discussed. The experimental techniques and analytical procedures developed for determining the energy at each stage of the discharge cycle are described. The four stages of energy which are of interest are the stored capacitor energy, the energy to the underwater spark, the energy in the pressure wave and the deformation energy in the workpiece. An analysis of the energy transfer through the system will provide data on the energy dissipated at each stage and permit the determination of the optimum process techniques during the process development. (Author)

AD-264 808 Div. 26, 30
(TIPSM/BRW) OTS price $3.60

SKF Industries, Inc., Philadelphia, Pa.
INFLUENCE OF LUBRICATION ON ENDURANCE OF ROLLING CONTACTS.
Appendix 1 to progress rept. no. 1, 22 June-22 Sep 61,
by J. C. Lawrence and H. E. Mahncke. 22 Sep 61,
36p. incl. illus. table, 38 refs. (Appendix 1 to rept. no. AL61T018, AD-264 809)
(Contract NOw-61-0716-c)
Unclassified report

DESCRIPTORS: (Bearings, Ball bearings, *Roller bearings, *Lubrication, Fatigue (Mechanics).) (Test equipment, Fatigue (Mechanics), Bearings, Tracer studies, Metals, Particles, Transport properties, Electrical conductance, Measurement, Films, Lubricants, Thickness, Determination, X-ray spectroscopy.)

An investigation is described which is intended to provide information on (1) estimation methods for the endurance life of rolling element bearings operating under extreme environmental speed or load conditions and/or lubricated by means other than an adequate supply of cool mineral oil or medium temperature grease, (2) estimation methods of further improved reliability for the endurance life of rolling element bearings requiring extreme reliability under any operating condition, (3) data on the performance in rolling element bearings, of a series of widely different lubricants and techniques for performance evaluation of other lubricants, and (4) an improved understanding of the physical phenomena occurring on rolling contact lubrication, especially the formation, maintenance or breakdown of fluid films, their dimensions, pressures and effect on endurance life. (Author)

AD-264 809 Div. 26, 30
(TIPSM/BRW) OTS price $5.60

SKF Industries, Inc., Philadelphia, Pa.
INFLUENCE OF LUBRICATION ON ENDURANCE OF ROLLING CONTACTS.
Progress rept. no. 1, 22 June-22 Sep 61,
by N. E. Sindlinger, J. C. Lawrence, and J. A. Martin. 22 Sep 61, 55p. incl. illus. 51 refs. (Rept. no. AL61T018)
(Contract NOw-61-0716-c)
Unclassified report

DESCRIPTORS: (Bearings, Ball bearings, *Roller bearings, *Lubrication, Fatigue (Mechanics).) (*Lubrication, *Elasticity, Deformation, *Hydrodynamics, Viscosity, Pressure, Theory.) (Lubrication, Films, Hydrodynamics, Thickness, Measurement, X-ray spectroscopy.) (Lubrication, Films, Detection, Electrical conductance.) (Bearings, Surfaces, Failure (Mechanics), Metals, Transport properties, Tracer studies.) Test equipment, *Bibliography.

A review is presented of the present state of development in: (1) elasto-hydrodynamic theory; (2) hydrodynamic film measurements utilizing x-ray techniques; (3) conductivity techniques for the detection of lubricant films; (4) radioisotope techniques for the detection of lubricant films; and (5) endurance studies utilizing the Barwell test machine, with preliminary Barwell test results. (Author)

AD-264 859 Div. 26, 17
(TIPSM/EET) OTS price $3.60

Armour Research Foundation, Chicago, Ill.
DEVELOPMENT OF 2400 F FORGING DIE SYSTEM.

Interim technical progress rept., 28 June-27 Sep 61,
by J. T. Berry, A. Murphy and others. Oct 61, 27p. incl. illus. tables.
(Contract AF 33(600)42861, ASD Proj. 7-886)
(ASD TR 7-886, vol. 2) Unclassified report

DESCRIPTORS: (Refractory materials, *Metals, *Forging, Extrusion, *Dies, Materials, Design.) (*Heat resistant alloys, Nickel alloys, Chromium alloys, Iron alloys, Molybdenum alloys, Titanium alloys, Zirconium alloys.) (Refractory coatings, Metal coatings on Molybdenum alloys with Silicon alloys, Chromium alloys, Aluminum alloys, Titanium alloys, Mechanical properties, Stresses, Deformation, Hardness, Oxidation, Tests.)

Work to extend hot forging die technology to refractory metals is under study. A new die heating system to evaluate the upper operating temperature limit of Inconel 713 C hot forging dies is being assembled; the dies have been redesigned to minimize the forging sequence by using an extrusion-forging process with hot dies; and laboratory evaluation of candidate 2400 F die materials is in progress. (Author)

AD-264 965 Div. 26, 14, 32
(TIPSB/CW) OTS price $3.50

Laboratories for Research and Development, Franklin Inst., Philadelphia, Pa.
A BIBLIOGRAPHY (WITH ABSTRACTS) ON GAS-LUBRICATED BEARINGS - REVISED,
by A. Peters and E. B. Sciulli, ed. by D. D. Fuller. 15 Oct 61, 180p. 479 refs. (Rept. no. I-A2049-16)
(Contract Nonr-234200, Proj. NR 061-113)
Unclassified report

DESCRIPTORS: (*Bibliography, *Gas bearings, Lubrication, Lubricants.)

This bibliography was prepared under a program of research on gas-lubricated bearings. This work is an expansion of the bibliography issued in September 1959 and contains 174 additional references. Wherever possible a resume in English of each reference is included. In most cases the abstracts were taken verbatim from the author, translation being made when required. When necessary or desirable, resumes were prepared or revised by FIL staff members. Every effort has been made to make this a comprehensive listing of all references published prior to July 1, 1961 which deal directly or indirectly with gas-lubricated bearings. (Author)

AD-265 035 Div. 26, 17, 12
(TIPSM/BRW) OTS price $4.60

Ryan Aeronautical Co., San Diego, Calif.
HIGH ENERGY FORMING OF METALLIC SHEET MATERIALS,
by D. S. Adams, V. S. Harrison, and J. P. Orr. Feb 61, 44p. incl. illus. tables (Ryan rept. 61B072)
(Contract DA 04-495-ORD-1921; Proj. TB4-002F)
(Technical rept. WAL 624.5/1)
Unclassified report

DESCRIPTORS: (Airframes, Structural shells, Cylindrical bodies, Hemispherical shells, Spheres, Manufacturing methods.) (*Explosive forming, *Sheets, Steel, Stainless steel, Aluminum alloys, Titanium alloys, Vanadium alloys, High pressure research, Mechanical properties, Metallurgical analysis, Microstructure, Tensile properties, Fatigue (Mechanics).) (Dies, Configuration, Materials.) Explosives, Test facilities, Instrumentation.

Tests were conducted on various materials to study their formability and metallurgical characteristics resulting from explosive forming process. Materials formed into various configurations indicated that this manufacturing technique lends itself to the forming of parts having intricate shapes, and is particularly adaptable for the fabrication of parts of large size beyond normal machine capacity. Metallurgical tests show that there was no detrimental effect to the material as a result of this forming process. Indications are that some materials must be formed at elevated temperatures. Consideration of the correlation between instrumentation techniques and laboratory analysis leads to the conclusion that mechanical properties of materials tested were improved by the extreme pressures applied by explosive forming. (Author)

AD-265 054 Div. 26, 17, 27
(TIPSM/EET) OTS price $2.60

Aerojet-General Corp., Sacramento, Calif.
STUDY OF DIFFUSION BONDING OF TUNGSTEN ALLOYS.
Summary rept. no. 2, 1 July-30 Sep 61,
by George K. Hickox. 11 Oct 61, 26p. incl. illus. (Rept. no. 0433-01Q-2)
(Contract DA 04-200-ORD-1077)
Unclassified report

DESCRIPTORS: (*Rocket motor nozzles, Sheets, *Tungsten, Tungsten alloys, Diffusion, Bonding, Brazing, Materials, Processing, Melting, Heat treatment, Tests.) Microstructure.

A rocket motor test nozzle was designed to evaluate the techniques of diffusion bonding. Commercially pure W sheet and doped W sheet were given recrystallization heat treatments to determine the approximate recrystallization temperatures. Specimens 1-sq. in. were heat-treated in 100 F increments from 2400 to 3100 F for 15 min. Each heat-treated specimen and an as-received sample of each material were metallographically prepared and photographed at 400X magnification. The recrystallization behavior of the materials for the given heat treatments are presented. Brazing tests with pure W sheet are being performed to evaluate the effects of braze joint thickness and joint coverage on the elevated temperature properties of the joints.

AD-265 062 Div. 26
(TIPSB/CCH) OTS price $4.60

Army Engineer Research and Development Labs., Fort Belvoir, Va.
DEVELOPMENT OF A SERIES OF PREFABRICATED LONG-RADIUS PIPE BENDS,
by Edward V. Browne. 19 Apr 61, 42p. incl. illus. tables (Technical rept. no. 1670-TR)
Unclassified report

DESCRIPTORS: (*Pipe bends, Design, Analysis, Construction, Installation, Tests, Test methods.) (Transportation, Handling.) Costs, Logistics, Military requirements.

This report covers the design and evaluation of a series of prefabricated long-radius bends for use in the construction of coupled-type military pipelines. The bends were hydrostatically tested and then installed in an operating test pipeline section to determine their hydraulic characteristics and suitability for use in military pipelines. This report concludes that: (1) prefabricated bends provide an adequate means

for adapting the pipeline to terrain variations along the selected route, (2) the availability of bends appreciably increases the construction capability of the pipeline company and decreases the logistical support needed for pipeline construction, and (3) the prototype bends as designed and tested are not suitable for use in military pipeline systems because they cannot be economically produced in the quantities required for military pipeline construction, the radius of bend is too long, and the 45 degree bend is not needed. (Author)

AD-265 075 Div. 26, 14, 17
(TIPSB/LH) OTS price $6.60

Naval Supply Research and Development Facility, Bayonne, N. J.
SHIPPING CONTAINERS,
by S. Hechtlinger and S. Stambler. 10 Apr 61, 70p. illus. tables (Engineering rept. no. 2.505921)
(Proj. NT-F015-03-003-177)
Unclassified report

DESCRIPTORS: (*Containers, Design, Construction, Materials, Steel, Aluminum, Alloys, Wood, Fiberboard, Plastics.) Tests, Standards.

Four selection charts permit a rapid determination of the existing container material(s) for a proposed container requiring one or more fixed or qualified characteristics, such as tare weight, gross cube and capacity (load and cube). The charts cover 41 rigid and collapsible containers fabricated of steel, aluminum, alloy metal, wood, fiberboard, plastic and combinations thereof. The containers have a cube capacity ranging from 4 1/2 to 1,632 cu. ft. and a load capacity ranging from 190 to 46,000 (legal highway pay load) pounds. For a particular design feature, a detailed review of the individual data sheets for each container can be made. Most of the containers are used for transporting general cargo and household goods by ocean, rail and truck transit. However, a number of the containers are peculiar to transporting certain commodities such as liquid and granular cargo and frozen food, and/or to air transit. (Author)

AD-265 133 Div. 26, 17, 14
(TIPSM/BRW) OTS price $1.25

Defense Metals Information Center, Columbus, Ohio.
GAS-PRESSURE BONDING,
by S. J. Paprocki, E. S. Hodge, and P. J. Gripshover. 25 Sep 61, 43p. incl. illus. 36 refs.
(DMIC rept. no. 159)
(Contract AF 33(616)7747)
Unclassified report

DESCRIPTORS: (High pressure research, *Solids, *Bonding, Welding, Pressure, Gases, Argon, Helium.) (*Refractory materials, Brittle materials, Ceramic materials, Cermets, Metals, Powder metals, Bonding, Coatings.) (Airframes, Aircraft, Guided missiles, Reactor fuels.) (Aluminum, Beryllium, Chromium, Molybdenum, Niobium, Stainless steel, Tantalum, Titanium, Zirconium.) (Aluminum alloys, Chromium alloys, Iron alloys, Molybdenum alloys, Niobium alloys, Titanium alloys, Vanadium alloys, Zirconium alloys.) (Beams, Honeycomb cores, Rods, Sheets.)

Solid-state-bonding by the gas-pressure-bonding process employs a gas at high pressure and elevated temperature in order to fabricate metallic or ceramic materials. The process has been used to produce metallurgical bonds between similar and dissimilar metals, ceramics, and cermet materials. It appears to be ideal for fabricating brittle materials or materials of widely differing properties. Consolidation of metallic and ceramic powders to densities approaching theoretical is readily accomplished by gas-pressure bonding at temperatures well below those normally required in sintering operations, and the resulting grain growth is held to a minimum. Numerous configurations have been fabricated from Be and Nb by the gas-pressure-bonding process. Examples are cited of typical nuclear fuel elements and various structural components of interest for aircraft and missile application. (Author)

AD-265 190 Div. 26, 17
(TIPSM/BRW) OTS price $10.50

Ladish Co., Cudahy, Wis.
FORGING PROCESS EMPLOYING SUPERIMPOSITION OF VIBRATORY FORCES CONCURRENTLY WITH NORMAL FORGING FORCES.
Final technical engineering rept., 23 June 58-21 June 61,
by Friedrich Fleischhacker. July 61, 139p. incl. illus. tables.
(Contract AF 33(600)37462)
(ASD TR 61-7-496) Unclassified report

DESCRIPTORS: (*Forging, *Forge presses, Hydraulic presses, *Vibrators, Vibration mechanisms, Electromagnetic waves, Hydraulic systems, Design.) (Forging, Vibration, Deformation, Lead, Aluminum, Aluminum alloys, Copper alloys, Tests.) Airframes, Aircraft, Guided missiles.

Investigation of the effect of superimposed vibratory forces over static forging press forces on metal deformation show that superimposed pulsating loads of frequencies of 120 and 180 cps exhibit different metal displacement effects than static forces of equal magnitude. An electromagnetic vibrator, used with both a 1,000-ton press and a 1,000-ton hydraulic jack, proved to be a feasible means of generating pulsating forces at 120 and 180 cps. A low range force frequency of 60 cps with sufficient force magnitude could not be produced by this vibrator. (Author)

AD-265 203 Div. 26, 17, 14
(TIPSM/BRW) OTS price $6.60

Massachusetts Inst. of Tech., Cambridge.
RESEARCH ON BOUNDARY CONDITIONS OVER THE TOOL-METAL INTERFACE IN PLASTIC-WORKING OPERATIONS.
Interim technical rept.,
by Walter A. Backofen and George W. Pearsall. 1961, 64p. incl. illus. tables, 33 refs.
(Contract DA 19-020-505-ORD-4916, Proj. TB4-001 and 5B93-32-001)
(WAL TR 620.5/1) Unclassified report

DESCRIPTORS: (Machining, *Plasticity, *Deformation, *Metals, Boundary layer, *Friction, Lubrication, Liquids, Solids, Films.) (Plastic flow of Aluminum, Disks by Pressure on Tools of Steel, Stresses, Shear stresses, Friction, Determination.) (Lubricants, Mineral oils, Oleic acids, Octanoic acids, Stearic acids, Sodium compounds, Stearates, Chromates, Ethylenes, Fluorides, Polymers, Lead, Films, Deterioration of Tests.)

Distributions of normal stress, shear stress, and coefficient of friction were determined at the interface between a steel tool and a plastically deforming Al disk. Measurements were made over a range of reductions for both lubricated (liquid and solid films) and unlubricated conditions.

In general, normal-stress distributions did not agree with those predicted by plasticity analyses which assume constant shear stress, or friction coefficient, across the interface. Better agreement was obtained when variations in shear stress caused by lubricant-film deterioration were taken into account. A size dependence of the average pressure requirements for reducing thin, lubricated disks of Al was associated with the development of lubricant-film breakdown at the periphery. By pressing geometrically similar disks of different size, the amount of interface sliding (a maximum at the periphery) was identified as a factor in the initiation of breakdown. (Author)

27. PROPULSION SYSTEMS

AD-264 713 Div. 27, 26, 17, 12
(TIPSM/BRW) OTS price $1.10

Lyon, Inc., Detroit, Mich.
DEVELOPMENT OF DEEP DRAWN-ONE PIECE HIGH PERFORMANCE ROCKET MOTOR CASE.
General rept. no. 7, 10 Apr-10 May 61.
10 May 61, 80p. incl. tables.
(Contract DA 20-018-ORD-23004)
Unclassified report

DESCRIPTORS: (Rocket motors, Solid rocket propellants, *Rocket cases for Manufacturing methods, Drawing (Machine processing), Tools, Dies.) (Forging, *Steel, Chemical analysis, Microstructure, Heat treatment, Tensile properties, Deformation, Grains (Metallurgy), Non-destructive testing, Ultrasonics.) (Nickel alloys, Iron alloys, *Titanium alloys, Vanadium alloys, Chromium alloys, Aluminum alloys, Deformation, Hardening, Microstructure, Fracture (Mechanics).)

AD-264 784 Div. 27, 10
(TIPSM/EJH) OTS price $13.50

Rocketdyne, Canoga Park, Calif.
PROPELLANTS FOR ELECTRICAL PROPULSION ENGINES OF THE CONTACT OR BOMBARDMENT ION TYPE.
Annual rept., 15 Mar 60-15 Mar 61,
by A. L. Cox, J. E. Colwell and others. Aug 61, 193p. incl. illus. tables, 64 refs. (Rept. no. R-2513-4)
(Contract AF 33(616)7063, Proj. 3048)
(ASD TR 61-150) Unclassified report

DESCRIPTORS: (*Electric propulsion, Electrostatic accelerators, Particle accelerators, Accelerators, *Propellants, *Ion beams, Operation, Specific impulse.) (*Molecules, *Anthracenes, *Phenanthrenes, *Ferrocene, Electron bombardment, *Ionization, Ionization potentials, Measurement, Stability, Decomposition, Physical properties, Mass spectroscopy.) (*Alkali metals, Sodium, Lithium, *Colloids, Ionization.) (*Plasma jets, Low temperature research, Particle beams, Acceleration, Magnetohydrodynamics.) Electron bombardment, Test equipment, Laboratory equipment, Mass spectrometers, Power supplies.

Research on the materials and methods for producing molecular and colloidal ion beams suitable for use in electrical propulsion devices is discussed. The substances under investigation for production of molecular ions were selected mainly on the basis of expected good ionization characteristics and high structural stability. The experimental techniques and results are described. Detailed drawings used for fabrication of a charged colloid generator based on the vapor-jet, rapid-condensation method of colloid preparation with charging by electron bombardment before condensation are presented. The possibilities of using neutral assemblies of positive ions with negative or electrons as cold, collisionless plasma in JXB acceleration devices are discussed. (Author)

AD-264 853 Div. 27
(TIPSW/NTM) OTS price $3.60

Aerospace Corp., El Segundo, Calif.
EFFECTS OF CONDENSATION ON ROCKET NOZZLE PERFORMANCE,
by S. W. Liu. 25 July 61, 32p. incl. illus. 10 refs. (Rept. no. TDR-594(1233-01)TN-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Rocket motor nozzles, *Condensation, Fluid mechanics, Fluid flow, Propulsion, Rocket propulsion, Supersonic nozzles, Hypersonic nozzles.) (Heat transfer, Mathematical analysis, Vapor pressure, Effectiveness, Nucleation, Ammonia, Nitrogen, Water vapor, Specific impulse, Enthalpy.)

A study was made of the part played by condensation as one of the mechanisms of energy transfer in the process of nozzle flow in a propulsion device. In order to confine attention to this particular mode of energy transfer, the working fluid and flow conditions are so chosen that the complicity of chemical kinetics is avoided. Equilibrium condensation is assumed, since from the point of view of heat impartation it represents an optimum condition which conceivably can be promoted by suitable additives. Both single and multicomponent working fluids are treated and the results are amenable to a single correlation which does not include the material properties explicitly, but is dependent only upon the states experienced by the working fluid through the process. The study is intended as a basis onto which other more complicated processes may subsequently be incorporated. As they stand, the results will find direct application to simple gas bottle low thrust devices used for attitude control in many spacecraft. (Author)

AD-264 865 Div. 27, 4, 9, 30
(TIPSE/RD) OTS price $10.50

Aerospace Corp., El Segundo, Calif.
NONEQUILIBRIUM PHENOMENA IN ROCKET NOZZLES.
Semiannual technical rept., 5 Dec 60-30 June 61,
by R. A. Hartunian. 30 June 61, 131p. incl. illus. tables, 80 refs. (Rept. no. TDR-594(1217-01)STR-1)
(Contract AF 04(647)594)
Unclassified report

DESCRIPTORS: (*Rocket motor nozzles, Exhaust nozzles, Operation.) (*Reaction kinetics, *Shock tubes, Gas flow, Theory.) (Gases, High temperature research, Transport properties.) (Thin films, Heat transfer, Measurement.) (Glow discharges, Discharges tubes.) (Shock waves, Velocity, Pressure, Atoms, Molecules, Density, Measurement.) (Thermometers, Thin films, Heat transfer, Measurement, Gas flow.)

Theoretical calculations of the vibrational relaxation times for hydrogen, as well as the

time variation of the atomic species due to passage of a centered expansion wave into the equilibrium dissociated gas in a large concentration of diluent, have been made. These permit accurate interpretation of the kinetics experiments. The chemical kinetics shock tube has been fully instrumented to measure shock velocity, static pressure, atom or molecule concentrations by vacuum uv spectroscopy, and cylindrical diaphragm bursting time. Preliminary pressure histories at the end wall of the shock tube, due to passage of an expansion wave, have been obtained. Techniques for fabricating rapid response atom concentration probes with good chemical definition of the catalytic surfaces have been developed. The theory of the flow about these probes in the calibrating, slow flow of a glow discharge tube has been completed. This permits accurate calibration of the catalytic efficiency of the probe surfaces. A brief review of the status of high temperature gas transport properties, as well as a theoretical analysis that suggests a new technique for obtaining diffusion coefficients, are presented. (Author)

AD-264 996 Div. 27, 26, 17, 12
(TIPSM/BRW) OTS price $1.10

Lyon Inc., Detroit, Mich.
DEVELOPMENT OF DEEP DRAWN - ONE PIECE HIGH PERFORMANCE ROCKET MOTOR CASE.
General rept. no. 8, 10 May-10 June 61,
by Wayne A. Martin. 10 June 61, 6p. illus.
(Contract DA 20-018-ORD-23004)
Unclassified report

DESCRIPTORS: (*Rocket motors, Solid rocket propellants, *Rocket cases, Manufacturing methods, Drawing (Machine processing), Tools, Dies.) (*Steel, Nickel alloys, Iron alloys, *Titanium alloys, Vanadium alloys, Chromium alloys, Aluminum alloys, Coatings and Lubricants for Drawing (Machine processing), Salts for Heat treatment.)

Progress is reported on the special tooling (dies and punches) for producing the 40-in.-diam monolithic rocket motor cases. Metallographic examinations of strain-hardened samples of 20% Ni, 25 Ni steels, and the all beta Ti alloys indicate the absence of internal microcracks. The Ni steels appeared to be compatible with the coating, soap solutions, and salt bath used for steel, while the all beta Ti alloy tended toward a marginal surface finish when heated in the salt bath. It is proposed to use the tooling from an obsolete 2-in. rocket program for sub-scale deep drawing tests on the 20% Ni and 25% Ni steel and the all beta Ti alloy.

AD-265 001 Div. 27, 26, 17, 12
(TIPSM/BRW) OTS price $1.60

Lyon Inc., Detroit, Mich.
DEVELOPMENT OF DEEP DRAWN - ONE PIECE HIGH PERFORMANCE ROCKET MOTOR CASE.
Rept. no. 9, 10 June-10 July 61,
by Wayne A. Martin. 10 July 61, 11p. incl. tables.
(Contract DA 20-018-ORD-23004)
Unclassified report

DESCRIPTORS: (*Rocket motors, Solid rocket propellants, *Rocket cases, Manufacturing methods, Drawing (Machine processing), Tools, Dies.) (Steel, Nickel alloys, Iron alloys, Heat treatment, Deformation, Forging, Drawing (Machine processing), Tests.)

Estimated delivery schedules are presented for the special tooling (dies and punches) required for the production of the deep-drawn 40-in.-diam rocket cases. Evaluation data for the process annealing and cold reduction of 20 and 25% Ni steels are also presented. The 20% Ni was annealed at 1500 F for 1 hr and the 25% Ni at 1600 F for 1 hr. No fractures were noted after 6 reductions of 30.5 to 34.5% on the 20% Ni, and 6 reductions of 26 to 29% on the 25% Ni alloy. Preliminary attempts were made to deep draw the 20% Ni alloy on the sub-scale (2-in) tooling. The results indicated that it is feasible to cold draw the material.

AD-265 023 Div. 27, 17, 30
(TIPSM/BRW) OTS price $1.10

Stanford Research Inst., Menlo Park, Calif.
TUNGSTEN AND ROCKET MOTORS.
Progress rept. no. 16 for 30 Sep 61,
by Gerald M. Gordon. 6 Oct 61, 5p. incl. illus.
(Contract NOrd-18619)
Unclassified report

DESCRIPTORS: (*Rocket motors, Solid rocket propellants, *Rocket motor nozzles, *Tungsten, Exhaust gases, Erosion, Thermal stresses, Shock.) (Test equipment, Test methods, Erosion, Plasma jets, Flame spraying, Aluminum compounds, Oxides, Particles, Exhaust gases, Simulation.) (Test equipment, Test methods, Thermal stresses, Shock, Thermocouples, Strain gages, Porosity, Fracture (Mechanics).)

Since a commercially available plasma powder-spraying head (Giannini Model no. SG-1) gave a satisfactory Al203 distribution in the plasma stream, it is planned to use this equipment for erosion experiments on W. An inert atmosphere chamber was built to prevent W oxidation. Details of the thermal shock apparatus are presented. Radial and circumferential thermal shock cracks were obtained on 90 and 87% dense sintered W ring specimens, respectively.

AD-265 025 Div. 27
(TIPSM/BRW) OTS price $1.60

Naval Weapons Lab., Dahlgren, Va.
PRESSURE AND TEMPERATURE IN THE EXHAUST OF SIDEWINDER MK 31 MOD 0 ROCKET MOTOR,
by R. G. Bolick. 19 Oct 61, 20p. incl. illus. tables (NWL rept. no. 1780)
(Task Assignment no. RMMP43-071.3)
Unclassified report

DESCRIPTORS: (Measurement of Temperature and Pressure in *Exhaust gases, Exhaust nozzles, Rocket motor nozzles, Exhaust systems, *Rocket motors.) (Test methods, Tests, Test equipment, Transducers, Thermocouples.)

Temperature and pressure measurements were made in the exhaust stream of 15 statically fired Sidewinder Mk 31 Mod 0 rocket motors. The peak rise in temperature and pressure is presented in the form of contour plots extending to a distance of 90 ft downstream in the case of temperature and of 35 ft downstream for pressure. (Author)

AD-265 341 Div. 27, 22
(TIPSW/NTW) OTS price $2.60

Consolidated Diesel Electric Corp., Stamford, Conn.
AUXILIARY PROPELLING DEVICE FOR THE 155MM

HOWITZER CARRIAGE, M1A2,
by W. M. Francullo. 1961, 23p. incl. illus.
(Contract DA 11-070-508-ORD-1403)
Unclassified report

DESCRIPTORS: (Hydraulic power systems, *Howitzers, Gun mounts, Transportation, Power drives, Hydraulic pressure pumps, *Propulsion, Control systems.) (Vehicle wheels, Power drives.)

A prototype auxiliary propelling system was developed which embodies, in concept, a hydrostatic transmission utilizing variable displacement reversible flow hydraulic pumps, and fixed displacement reversible motors. The system, as designed, does not impair the function of the weapon; achieves minimum weight with compactness; utilizes modular construction for field mobility, portability; and provides quick field installation and maintenance. The drive system utilizes the extreme weight of the weapon as an asset rather than a liability in achieving traction. The system consists of a hydraulic power package, two lightweight wheel drive gear boxes, and two hydraulic lines. The system utilizes Continental Engine Model 4A084-1 as the power source. An integrated mechanical computer in the control unit permits differential motion to the drive wheels allowing turning on any radius down to zero degrees. The hydraulic wheel drive system has numerous applications for both commercial and military equipment. (Author)

AD-265 428 Div. 27, 12, 22
(TIPSM/EJH) OTS price $2.60

Ogden Air Materiel Area, Hill Air Force Base, Utah.
EVALUATION OF IGNITER RAM-JET ENGINE, M114.
Airmunitions test rept.,
by Kenneth A. Kartchner. Sep 61, 23p. incl. illus. tables (Rept. no. OOY TR-61-37)
Unclassified report

DESCRIPTORS: (Guided missiles, Surface to surface, *Electric igniters, *Electric detonators, *Igniters for *Ramjet engines, Ignition.) (Igniters, Reliability, Moisture, Humidity, Coatings, Plastic coatings, Epoxy resins.) (*Igniters, Firing mechanisms, Boron compounds, Polymers, Vinyl chlorides, Strontium compounds, Nitrates, Magnesium.) Tests, Test equipment, Test methods:

One hundred and one igniters were functioned immediately after removal from the sealed cans. All 85 igniters from Lot PA-67-3 and 15 igniters from Lot PA-67-1, functioned with a small delay. The other igniter from Lot PA-67-1 failed to ignite the illuminant. Another group of igniters were conditioned to 120 F and 95% humidity from 6 to 72 hours. All igniters functioned after 24 hours of conditioning. At the end of 48 hours of conditioning 3 igniters from Lot PA-19-1 functioned, all other igniters failed. Another group of 18 igniters from Lot PA-67-2 and 6 igniters from Lot PA-19-1 were coated with an epoxy resin and placed in phenolic engine cases before subjecting them to 120 F and 95% humidity. Six igniters from Lot PA-67-2 were functioned after 48 hours and 96 hours; the remaining igniters functioned normally after 192 hours of conditioning. The epoxy coated igniters are recommended for use where there are high humidity conditions. (Author)

28. PSYCHOLOGY AND HUMAN ENGINEERING

AD-264 766 Div. 28
(TIPSB/MS) OTS price $17.50

Office of Naval Research, Washington, D. C.
TRI-SERVICE CONFERENCE ON SELECTION RESEARCH, PENSACOLA, FLORIDA, MAY 25, 26, 27, 1960.
1960, 273p. incl. illus. (ONR Symposium rept. no. ACR-60)
Unclassified report

DESCRIPTORS: (*Conferences, *Job analysis.) (*Naval personnel, *Military personnel, *Selection, Symposia.) (*Military organizations, Standards, Classification.) (Naval personnel, Personality, Leadership, Effectiveness, Measurement, Tests.)

The first two-day conference emphasized general job analysis methods. The second two-day conference concerned research planning on job qualifications. The third two-day conference developed around the topic of methods and techniques for determining staffing standards in military organizations. The agenda for this fourth tri-service conference was concerned with research on the cognitive and non-cognitive factors affecting the selection standards employed by the military services. The subject matter of the conference was divided into the following categories: (1) models, (2) aspects of classification, (3) leadership, (4) statistical methodology, and (5) noncognitive measures. In addition, an evening session was held, the subject being a paper on The Computer as a Research Instrument in the Behavioral Sciences. In contrast to the earlier conferences, the papers delivered at this conference were written and distributed beforehand, so that each two- or three-hour session was in the nature of a seminar with emphasis on the discussion of ideas. These Proceedings are a collection of the papers presented at the conference, many of which, however, have been somewhat revised as a result of stimulating discussions they evoked at the conference. (Author)

AD-264 777 Div. 28
(TIPSB/MS) OTS price $2.60

Maryland U., College Park.
GRAMMATICAL CATEGORY. A ROTE LEARNING AND WORD ASSOCIATION ANALYSIS,
by Murray Glanzer. Sep 61, 21p. illus. tables, 12 refs.
(Contract DA 49-007-md-1004)
Unclassified report

DESCRIPTORS: (*Language *Learning, Verbal behavior, Analysis of variance, Tests.)

Three experiments using rote learning and word association techniques were carried out to analyze differences in the use of content and function words. In Experiment I, paired-associates learning (English word--nonsense syllable, and nonsense syllable--English word) was carried out and clear-cut differences favoring the content words were established. In Experiment II, an attempt was made to analyze these differences on the basis of the number of associations generated by words from the several grammatical categories. This attempt led to conflicting results and abandonment of the simple word association approach. Experiment III was based on the concept of function words as partially-bound morphemes. It was argued that the function words are incomplete as units and that to have them function efficiently in learning, it was

necessary to surround them with other elements. In Experiment III, words from the several categories were surrounded with minimal context, by using triplets (nonsense syllable--English word--nonsense syllable) in a rote learning situation. When the words were embedded in such minimal context, function words were easier to learn than content words. The implications of these findings for the consideration of parts of speech are explored. Analysis on the basis of the subject's customary speech unit is presented as an alternative to analysis on the basis of meaning or meaningfulness. (Author)

AD-264 837 Div. 28
(TIPSB/MS) OTS price $4.60

Washington U., St. Louis, Mo.
SOME EFFECTS OF CLOSE AND PUNITIVE STYLES OF SUPERVISION,
by Robert C. Day and Robert L. Hamblin. Aug 61, 41p. incl. tables, 13 refs. (Technical rept. no. 8)
(Contract Nonr 81611)
Unclassified report

DESCRIPTORS: (*Group dynamics, Leadership, Effectiveness, Tests.) (*Reaction (Psychology), Behavior, Sociometrics.)

An experiment based on a two-by-two factorial design was conducted to test hypotheses involving the relationship of four supervisory styles to aggressive feelings and actions of subordinates. As manipulated in the experiment, the supervisory styles can be arrayed on two continua: the close versus general, and the punitive versus non-punitive. The results show that close as compared with general supervision produced a significant increase in aggressive feelings toward the supervisor, a significant increase in indirect aggression toward the supervisor through lowered productivity, an insignificant increase in verbal aggression toward the supervisor, and finally, an increase of borderline significance in aggressive feelings toward co-workers. The results also indicate that punitive as compared with non-punitive supervision produced a significant increase in aggressive feelings toward the supervisor, a significant increase in indirect aggression through lowered productivity, a significant increase in verbal aggression, but no significant increases in aggression toward co-workers or the task. Furthermore, the results indicate that the relationship between close supervision and aggressive feelings is mediated by self-esteem, a personality characteristic of the subordinate. (Author)

AD-264 838 Div. 28
(TIPSB/MS) OTS price $4.60

Washington U., St. Louis, Mo.
AN EVALUATION OF SOME ASSUMPTIONS OF THE DAVIS-MOORE THEORY OF STRATIFICATION,
by L. Keith Miller and Robert L. Hamblin.
Sep 61, 43p. incl. illus. tables, 22 refs.
(Technical rept. no. 10)
(Contract Nonr-81611)
Unclassified report

DESCRIPTORS: (*Behavior, *Group dynamics, *Sociometrics, Sociology, Theory, Tests.)

An attempt was made to first isolate the underlying assumptions in the Davis-Moore theory--the propositions about individual behavior and the propositions about elementary social behavior. Then, having been conceptualized in a general form, one assumption or proposition which is crucial to the theory was evaluated using some new evidence from an investigation designed specifically to test this assumption, and using as well a substantial accumulation of relevant evidence from past investigations. The implications of the evidence for the Davis-Moore theory is discussed in some detail. (Author)

AD-264 839 Div. 28
(TIPSB/MS) OTS price $3.60

Washington U., St. Louis, Mo.
THE ELEMENTS AND LOGIC OF GENERAL THEORY IN SOCIAL SCIENCE,
by Robert L. Hamblin, Sep 61, 29p. incl. illus.
(Technical rept. no. 11)
(Contract Nonr-81611)
Unclassified report

DESCRIPTORS: (*Behavior, Sociometrics, Theory.) *Adjustment (Psychology), *Reaction (Psychology), *Group dynamics.

On the assumption that abstraction is a major goal in developing theory in social science, as well as in science generally, the purpose is to outline the essential elements and essential logic of general theory, and thus suggest how such general theory might systematically be formulated. First an important distinction is made between the conceptual and operational levels of theory. In making this distinction, five key metaconcepts are defined, illustrated, and discussed--namely, conceptual variables, conceptual hypotheses, operational variables, operational hypotheses, and epistemic correlations. Then the discussion is focused on the relationships of the five key metaconcepts to one another, and finally on the logic of epistemic derivations, of testing general theory, and of establishing epistemic validity. (Author)

AD-264 909 Div. 28
(TIPSB/MS) OTS price $2.60

Princeton U., N. J.
PRINCETON STUDIES OF SENSORY DEPRIVATION.
Final rept., 1 Sep 55-31 Aug 61,
by Jack A. Vernon. 31 Aug 61, 20p. 10 refs.
(Contract DA 49-007-md-671)
Unclassified report

DESCRIPTORS: (*Sensory perception, Inhibition, Stress (Physiology).) (*Reaction (Psychology), Reaction time, Learning, Perception, Stimulation, Motor reactions.) *Adjustment (Psychology).

Contents:
Findings from Princeton studies of sensory deprivation
- Influence of sensory deprivation upon learning
- The more subtle effects of sensory deprivation upon learning
- The effects of sensory deprivation upon some perceptual and motor skills
- Visual perception and sensory deprivation
- The effect of sensory deprivation upon pain perception
- The effect of sensory deprivation upon suggestion
- Time perception during sensory deprivation

Those subjects who required an early release from sensory deprivation
- The need for stimulation during sensory deprivation
- Reaction time as affected by sensory deprivation

AD-264 916 Div. 28
(TIPSB/MS) OTS price $4.60

Personnel Lab., Aeronautical Systems Div., Lackland Air Force Base, Tex.
RELATIONSHIPS BETWEEN PERSONALITY TRAITS, PHYSICAL PROFICIENCY, AND CADET EFFECTIVENESS REPORTS OF AIR FORCE ACADEMY CADETS,
by Ernest C. Tupes and Margorie N. Kaplan.
Sep 61, 40p. incl. illus. tables.
(Proj. 7717)
(ASD TN 61-53) Unclassified report

DESCRIPTORS: (*Personality, Personality tests, Aviation personnel, Physical fitness, Statistical analysis, Factor analysis, Measurement, Effectiveness.)

Cadets in 3 Air Force Academy classes rated each other on 20 personality traits as well as on physical ability and officer potential. For two of the classes objective measures of physical proficiency were also available. Intercorrelation matrices within each class were analyzed to determine relationships between personality trait ratings and Cadet Effectiveness Ratings, and to determine the factor structure underlying the ratings. Traits such as responsibility, perseverance, good adjustment, poise, social polish, and social intelligence were most highly related to CERs, while traits of surgency or extroversion such as talkativeness, frankness, adventurousness and sociability bore little or no relationships to CERs. The major portion of individual differences in CERs are related to these personality trait ratings. When compared with OCS candidates and majors attending Command and Staff School, the Academy cadets were found to differ little from these groups in the pattern of the personality trait versus CER relationships. Five personality trait ratings were identified which correspond closely to the five (Surgency, Agreeableness, Conscientiousness, Emotional Stability, and Culture) found in other analyses. A sixth factor was identified as physical ability. (Author)

AD-264 922 Div. 28, 29
(TIPSB/CCH) OTS price $10.50

Chicago U., Ill.
STUDY OF THE BASES FOR CHANGING FOOD ATTITUDES.
Rept. no. 3 (Final) 15 May 58-15 Sep 60,
by Peter H. Rossi, Herbert Hamilton, and David Gottlieb. 15 Sep 60. 129p. incl. illus. tables, 16 refs.
(Contract DA 19-129-qm-1117)
Unclassified report

DESCRIPTORS: (*Food, Attitudes, *Military personnel.) (*Adjustment (Psychology), Sociometrics, Sampling, Mathematical analysis.)

This report presents the findings of a survey investigating relationships between soldiers' food attitudes and a series of social psychological and group factors.

AD-264 969 Div. 28
(TIPSB/MS) OTS price $5.60

American Inst. for Research, San Mateo, Calif.
THE EFFECTS OF PROMPTING TRIALS AND PARTIAL-CORRECTION PROCEDURES ON LEARNING BY ANTICIPATION,
by David Angell and Arthur A. Lumsdaine. Sep 61, 53p. incl. illus. tables, 36 refs. (Research rept. no. AIR-C14-9/61-SR5)
(Contract AF 49(638)681)
(AFOSR-1343) Unclassified report

DESCRIPTORS: (*Learning, Theory.) (*Training, *Training devices, Effectiveness.)

Two experiments are reported which were designed to provide data on several issues relevant to auto-instructional techniques. The first of these issues is the question of the relative effectiveness of prompting trials and anticipation (confirmation) trials. The second issue is the question of the effectiveness of partial-cueing techniques. The two experiments used different paired-associate materials and somewhat different experimental procedures and designs. Results of Experiment I showed a highly significant effect due to prompting trials, a significant effect due to correction treatment in the case where no prompting trials had been given, and a significant interaction which reflects two clear experimental facts: (1) a prompting trial was more effective than an anticipation trial when partial correction was employed but not when full correction was used, and (2) full correction is superior to partial correction when there had been no initial prompting trials but not when there had been two or more prompting trials. In Exp. II, the advantage of prompting trials over anticipation trials (found in Exp. I) did not materialize, and there was in fact some indication of a trend in the opposite direction. The differing results of the two experiments is interpreted as being dependent on the nature of the correction treatment: in Exp. I, subjects did not respond overtly following partial correction; in Exp. II, they continued to choose from among the partial correction alternatives until they made a correct response. (Author)

AD-265 070 Div. 28
(TIPSB/MS) OTS price $1.60

American Inst. for Research, San Mateo, Calif.
A STUDY OF SUBJECT-CONTROLLED PARTIAL CUEING IN PAIRED-ASSOCIATE LEARNING,
by David Angell and Arthur A. Lumsdaine.
Sep 61, 13p. incl. tables (Research rept. no. AIR-C14-9/61/SR4)
(Contract AF 49(638)681)
(AFOSR-1342) Unclassified report

DESCRIPTORS: (*Learning, *Training devices, Automatic, Effectiveness.) Teaching machines.

A study was performed to determine what effect, if any, a training procedure which utilized partial cueing at the option of the learner would have upon the learning of paired-associate materials. The technique was a simple one which provided partial cueing by successive revelation, upon student demand, of the letters of the 3-letter response term in an S-R pair. No instrumentation was employed; E served as the device by which response components were revealed (aurally) to the student. The data showed little difference in over-all effectiveness between the partial-cueing technique and a standard anticipation procedure for learning paired associates. When the effectiveness of the two training procedures was examined with respect to ''task difficulty''--items having been dichotomized into difficult and easy, and Ss having been been dichotomized into slow learners and fast learners--the partial-cueing procedure was found to be somewhat more effective for slow learners with hard items, and slightly less effective for fast learners with easy items. This interaction was marginally significant ($P < .10$). The findings are discussed in relation to other studies of partial cueing in paired-associate learning. (Author)

Division 28 - PSYCHOLOGY AND HUMAN ENGINEERING

AD-265 094 Div. 28, 23
(TIPSB/MS) OTS price $1.60

Bureau of Naval Personnel, Washington, D. C.
THE RELATIONSHIP OF ATHLETIC ABILITY, SPORTS KNOWLEDGE AND PHYSICAL PROFICIENCY TO OFFICER PERFORMANCE AND CAREER MOTIVATION,
by Bernard Rimland. Aug 61, 16p. incl. tables, 46 refs. (Technical bulletin 61-12)
Unclassified report

DESCRIPTORS: (*Naval personnel, *Officer personnel, *Selection, Physical fitness, Recreation, Tests, Effectiveness.)

This report presents research findings dealing with the relationship of sports interest and participation and of actual physical proficiency to the performance of duty and career motivation of military officers. Both new research and a review of previously reported research are included. The research findings run contrary to common expectation; neither an applicant's level of interest in sports nor his record of participation in sports appears to be useful in predicting how well he will perform his military duties or how likely he will be to elect a military career. With regard to actual physical proficiency (push-ups, running speed, etc.), the evidence is less consistent, though still generally negative. Tests of physical proficiency have in certain cases been found to be of some use in predicting officer performance, especially where the duties themselves are physically demanding. (Author)

AD-265 329 Div. 28
(TIPSB/MS) OTS price $6.60

Washington U., St. Louis, Mo.
LEADERSHIP COMPLIANCE AND GROUP BEHAVIOR,
by Richard deCharms and Winnie Bridgeman. Aug 61, 61p. incl. tables, 14 refs. (Technical rept. no. 9)
(Contract Nonr-81611)
Unclassified report

DESCRIPTORS: (*Leadership, *Behavior, *Group dynamics, Reaction (Psychology), Adjustment (Psychology).) (*Leadership, Factor analysis.)

The members' reactions to the leader were studied especially in the realm roughly termed morale. A factor analysis demonstrated 5 factors perceived by subjects in evaluating the leader prior to the manipulation. These factors were motivational persistence of the leader, his competence, Ss feelings of reciprocity toward him, their feelings of security with respect to his actions, and their feelings of security in initiating personal contact with him. All of these factors were significantly related to the manipulation of leadership compliance. In addition, Ss motivation to work for the leader as measured by productivity was significantly related to the leader's compliance. It appears that a statement of willingness to comply to requests of the group has important effects on Ss' perception of the leader, their feelings about future interaction with him, and their motivation in the situation. However, Ss' motivation is most drastically changed when the leader verbalizes his intention not to comply and then behaviorally does comply. Leadership compliance is an important aspect of the democratic leader's behavior since this is one way which he validates his position of leader. The authoritarian leader may have the power of external compulsion and need not depend on compliance. (Author)

AD-265 389 Div. 28, 7
(TIPSB/MS) OTS price $.50

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
A GAME THEORY APPARATUS FOR PSYCHOLOGICAL RESEARCH.
Rept. on Psychological Research on Human Performance,
by Noel F. Schwartz. July 61, 6p. incl. illus. (Proj. no. 7183)
(ASD TR 61-239) Unclassified report

DESCRIPTORS: (*Psychology, Reaction (Psychology), *Games theory, Test equipment, *Electrical equipment, Circuits, Design.)

This report describes an electrical apparatus designed to facilitate psychological research in games of strategy for game matrices no larger than 3 x 3. The description includes an operational procedure and an explanation of the circuitry with an accompanying photograph of the equipment and simplified schematic. The apparatus provides push-button selection of matrix columns by one subject and rows by his opponent who may be another subject or the experimenter. These selections determine numerical payoff values of varying desirability for the players. This conflict situation allows the psychologist to study various aspects of human behavior, such as strategy formation. (Author)

AD-265 405 Div. 28
(TIPSB/MS) OTS price $1.60

Human Factors Research, Inc., Los Angeles, Calif.
THE ACCURACY OF JUDGMENTS OF EYE FIXATIONS.
Technical memo. on Human Factor Problems in Anit-Submarine Warfare,
by James J. Mcgrath and James F. Hatcher. Sep 61, 13p. incl. illus. (Technical memo. no. 206-13)
(Contract Nonr-264900, Proj. NR 153-199)
Unclassified report

DESCRIPTORS: (*Eye, Motion, Test methods.) (*Attention, *Visual perception, *Perception, *Vision, Tests.)

An attempt was made to provide descriptive data on the judgment of eye fixations from photographs, a method similar to that devised by Baker (Science 132:674-675, 1960). It appears that the main danger in using this technique for studying the observing behavior of subjects is the inaccuracy with which downward fixations are judged. As a generalization, one may say that foveal vision (with reference to the center point) may be misjudged as peripheral vision and peripheral vision may be misjudged as foveal vision in the order of five to ten percent of the time. It is also possible that a camera with better resolution than the one used in this study would produce better performance by the judges. It is further possible that judgments could be improved by the use of motion pictures, rather than still photographs. (Author)

AD-265 434 Div. 28, 16
(TIPSB/CCH) OTS price $.50

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
MEASURES OF REMOTE MANIPULATOR FEEDBACK: DIFFERENTIAL SENSITIVITY FOR WEIGHT.

Rept. for Nov 59-Feb 60 on Human Factors in Advanced Flight,
by Billy M. Crawford. Mar 61, 13p. incl. illus. tables.
(Proj. 7184)
(WADD TR 60-591, pt. 1)
Unclassified report

DESCRIPTORS: (Human engineering of *Remote control systems, Lift, Handling, Sensitivity, Operation.)

The psychophysical Method of Constant Stimulus Differences was used to determine difference thresholds and Weber ratios for both direct and remote lifting of two standard weight stimuli. A Model 8 Master-Slave Manipulator was used for remote lifting. For 1000-gram weight, difference thresholds were 65.42 and 110.45 grams for direct and remote lifting, respectively. Corresponding difference thresholds for a 3000-gram standard were 149.33 and 195.69 grams. The difference threshold indicates the fineness of weight discrimination which can be expected of a worker. Increases in difference thresholds as a function of remote lifting reflect the loss of feel associated with remote handling. The difference threshold is proposed as a criterion of the fidelity of cues reflected to the operator by the remote-handling system. (Author)

AD-265 435 Div. 28
(TIPSB/MS) OTS price $.50

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio.
MEASURES OF REMOTE MANIPULATOR FEEDBACK: ABSOLUTE JUDGMENTS OF WEIGHT.
Rept. for Nov 59-Feb 60 on Human Factors in Advanced Flight,
by Billy M. Crawford. Mar 61, 11p. incl. illus. tables.
(Proj. 7184)
(WADD TR 60-591, pt. 2)
Unclassified report

DESCRIPTORS: (*Perception, Measurement, Statistical analysis, Test methods.)

Man's ability to estimate weights was determined for two lifting conditions: direct manual lifting and remote lifting by means of an Argonne National Laboratory Model 8 Master-Slave Manipulator. The effect of interpolated weight-lifting experience upon absolute judgments of weight was also examined. Results show that: (a) means of estimates made by subjects who lift weights remotely are greater than means of estimates made by subjects who lift the same weights directly; (b) subjects tend to underestimate weights lifted directly; (c) estimates for the remote-lifting condition, even though more accurate on the average, are more variable; and (d) the tendency for subjects to underestimate weights which follow heavier weights and overestimate those which follow lighter weights is more pronounced for direct lifting than for remote lifting. (Author)

AD-265 459 Div. 28, 23
(TIPSB/MS) OTS price $4.60

Adjutant General, Dept. of the Army, Washington, D. C.
SELECTING THE FIRST-LINE SUPERVISOR,
by Abraham H. Birnbaum, Isaak D. Orleans, and John deJung. June 61, 43p. incl. illus. tables.
(HFRB Technical research rept. no. 1121)
(DA Proj. 2L95-60-001)
Unclassified report

DESCRIPTORS: (*Personnel, *Selection.) (*Aptitude tests, Design, Effectiveness.) (*Leadership, Behavior, Identification.)

The Army Civilian Supervisor Selection Battery, implemented operationally in July 1959, is designed for use in selecting Wage Board first-line supervisors. The battery consists of three measures--the Basic Ability Test, a test of mental capacity, the Supervisory Practices Test, a test of supervisory judgment, and the Supervisor Performance Report, a descriptive phrase test filled out by the supervisor who deserves the candidate in a tryout job. In response to a requirement, the present research study was undertaken to provide for alternate forms of the battery components and to evaluate the effectiveness of both the old and new tests on an Army-wide basis. Using a concurrent design, the old and new tests were validated on a sample of 623 Wage Board supervisors against a criterion of average ratings of supervisory skills by supervisors and peers. New standardized score norms were developed for the Supervisor Performance Report for which a new form was not required. On the basis of research findings, it was concluded that neither the Basic Ability Test nor the Supervisory Practices Test has utility for the identification of potentially good supervisors. The Supervisor Performance Report, however, appeared to be a more effective predictor in determining the individuals who should be promoted to supervisory positions. (Author)

AD-265 467 Div. 28, 23
(TIPSB/MS) OTS price $3.60

Adjutant General, Dept. of the Army, Washington, D. C.
DEVELOPMENT OF EXPERIMENTAL SELECTORS FOR ARMY HELICOPTER PILOT TRAINEES--PERSONALITY CONSTRUCTS,
by Nathan Rosenberg, Donald M. Skordahl, and Alan A. Anderson. Aug 61, 32p. incl. tables.
(HFRB Technical research note no. 115)
(DA Proj. 2L95-60-001)
Unclassified report

DESCRIPTORS: (*Personnel, *Pilots, *Selection.) (*Aptitude tests, Design, Effectiveness.) (*Leadership, Personality, Behavior, Identification.) (Helicopters, *Training.)

As part of a long-range research effort to improve selection of helicopter pilot trainees and to reduce rate of attrition during training, four personality instruments were developed, designed primarily to predict leadership performance in operational units. Data were obtained on 242 helicopter pilot trainees constituting six entering classes of the Army Primary Helicopter School. The effectiveness of 57 construct keys and of one overall judgment key as predictors of helicopter pilot training success was estimated and the validity of the numerous construct keys was assessed against various aspects of pilot training. Of these aspects, successful completion of preflight training and leadership ranking by peers were considered most predictable by the personality measures. (Author)

AD-265 468 Div. 28
(TIPSB/CW) OTS price $2.60

Adjutant General, Dept. of the Army, Washington, D. C.
ABSTRACTS OF HFRB RESEARCH PUBLICATIONS--FY 1961,
by Emma E. Brown and Ruth T. Walton. Aug 61, 26p. 29 refs. (HFRB Technical research note no. 116)
(DA Proj. 2L95-60-001)
Unclassified report

DESCRIPTORS: (*Psychology, *Military personnel, Selection, Training, Aptitude tests, Intelligence tests, Psychomotor tests, Attitudes, Behavior, Leadership.)

This report identifies both by publication serial number and by Research and Development Research Task all research publications prepared and released by the Human Factors Research Branch of the Adjutant General's R and D Command in FY 1961. The listing includes 2 Technical Research Reports, 8 Technical Research Notes, 3 Research Studies, and 16 Research Memorandums. Abstracts have been prepared for the majority of FY 1961 publications. Where a publication has been abstracted, the principal research findings have been described as much as possible in non-technical language. Technical language has been used as the most expeditious method of communicating details of research and analysis. (Author)

AD-265 477 Div. 28, 30
(TIPSB/MS) OTS price $3.00

Naval Research Lab., Washington, D. C.
CREATIVITY IN RESEARCH AND INVENTION IN THE PHYSICAL SCIENCES. AN ANNOTATED BIBLIOGRAPHY,
comp. by Mildred Benton. June 61, 151p. 1359 refs. (NRL Bibliography no. 19)
Unclassified report

DESCRIPTORS: (*Bibliography, *Scientific research, *Scientific personnel, Aptitudes, Behavior, *Reasoning.) *Inventions.

29. QUARTERMASTER EQUIPMENT AND SUPPLIES

AD-264 901 Div. 29
(TIPSB/LH) OTS price $5.60

California Agricultural Experiment Station, Davis.
DEHYDRATION METHODS FOR INSTANT BREAD MIX FLAVORS.
Rept. no. 9 (Final) 15 May 58-31 July 60,
by C. O. Chichester and Marion Simone.
31 July 60, 52p. incl. illus. tables.
(Contract DA 19-129-qm-1171, Proj. 7-84-06-031)
Unclassified report

DESCRIPTORS: (Food, *Bread, *Dehydration, Dry food mixes, *Processing, Analysis, Consumption.)

The applications of freeze, spray and drum drying techniques were successful in producing dried bread-flavoring materials from cell-free liquid broths. Breads made with these mixtures were ranked slightly different in bread flavor intensity and no different in preference by a laboratory panel. When compared with bread made with the liquid flavoring, both laboratory and consumer panels rated the bread prepared with dried broths slightly inferior in flavor quality or acceptability to that prepared with liquid. No significant differences were indicated by either panel among the three dried flavor preparations. An over-all consumer rating of the instant breads was 4.65 (between like slightly and neither like nor dislike on a 7-level structured scale). Variations in consumer responses to the bread were affected by such factors as age, sex, bread eating habits, and loaf volume. Of several variations in broth formula or fermentation procedure applied to enhance flavoring capacity, the retention of yeast cells in the dried product was most effective. Addition of flour to the fermentation medium also resulted in increased flavor intensity. (Author)

AD-265 002 Div. 29
(TIPSB/CCH) OTS price $1.60

Kansas State U., Manhattan.
DETERMINATION OF THE FEASIBILITY OF PRODUCING NON-STALING BREAD-LIKE PRODUCTS.
Rept. no. 9 (Final), 15 Mar 58-15 Mar 60,
by John A. Johnson and Donald Miller. 15 Mar 60, 10p. 28 refs.
(Contract DA 19-129-qm-1119)
Unclassified report

DESCRIPTORS: (Determination and Feasibility studies of Production of Carbohydrates and *Bread, Deterioration, Countermeasures, Fatty acids and Enzymes.) (Aging, Tests, Storage, Experimental data.)

The use of 1% fatty acid based on flour weight caused bread crumb to be 40% softer than the control at 72 hours of storage. The addition of a thermostable bacterial amylase (7 SKB units per pound) with fatty acids produced bread with 60% softer crumb than the control at the end of 72 hours of storage. Storage of bread for 15 or 30 days did not appear feasible. (Author)

AD-265 310 Div. 29, 26
(TIPSB/LH) OTS price $1.00

Thompson, John I., and Co., Inc., Washington, D. C.
INDIVIDUAL ALUMINUM FEEDING CONTAINERS. PART II. (FINAL DESIGN) FEEDING CONTAINER ASSEMBLY FOR SPACE FLIGHT.
Rept. for 1 Mar-31 July 60, on Equipment for Life Support in Aerospace,
Mar 61, 35p. incl. illus.
(Contract AF 33(616)7080, Proj. 6373)
(WADD TR 60-522, vol. 2)
Unclassified report

DESCRIPTORS: (*Containers, Food, Space flight.) Design, Aluminum, Aluminum alloys, Coatings, Manufacturing methods, Effectiveness.

Designs have been evolved of a container, quick opening device, inner seal, food expelling device pressure relief method during heating, and mouthpiece for an individual aluminum feeding container for space flight use. The pertinent parameters of these designs are ability to function under zero gravity, and presentation of food in a palatable, acceptable condition. The selected design consists of a rectangular container with a round dispensing end sealed by a foil inner seal and a screw-on cap for quick and easy access and hermetic sealing. The bottom plate also contains a screw-on cap for access to the enclosed expelling plate. The container will be fabricated by impact extrusion from 1100-F aluminum, the other metal components by forming, and casting. (Author)

AD-265 492 Div. 29
(TIPSB/CCH) OTS price $14.00

Quartermaster Food and Container Inst. for the Armed Forces, Chicago, Ill.
PROCEEDINGS, SEVENTH CONTRACTORS' MEETING QUARTERMASTER CORPS' RADIATION PRESERVATION OF FOODS PROJECT, CHICAGO, ILLINOIS, 6-8 JUNE 1961.
July 61, 205p. incl. illus. tables (QMF&CI Rept. no. 14-61)
Unclassified report

DESCRIPTORS: (Conferences, Radiation effects, *Food, Preservation.)

30. RESEARCH AND RESEARCH EQUIPMENT

AD-264 720 Div. 30, 8
(TIPSP/MFA) OTS price $6.60

Research Lab. of Electronics, Mass. Inst. of Tech., Cambridge.
SEQUENTIAL TRANSMISSION OF DIGITAL INFORMATION WITH FEEDBACK.
Doctoral thesis,
by Michael Horstein. 8 Sep 60, 64p. incl. illus. 17 refs. (Technical rept. no. 375; Lincoln Lab. rept. no. 34G-0006)
(Contract DA 36-039-sc-78108; In cooperation with Lincoln Lab., Mass. Inst. of Tech., Lexington, Contract AF 19(604)5200)
Unclassified report

DESCRIPTORS: (*Sequential analysis and Information theory of Communication systems, *Digital systems, Electronic equipment with *Feedback, Memory devices.) (Coding, Transmission, Noise, Channel selectors, Signals.) (Errors, Probability, Statistical distributions, Functions, Linear systems, Numerical analysis, Theses.) Pulse communication systems.

The asymptotic error-correcting capability of several types of sequential transmission and the examination of a particular sequential transmission scheme are given. In sequential transmission schemes, as in one-way communication, there are two general approaches to the encoding of information for transmission over a noisy channel. The information or message sequence (which we assume is a binary sequence in which each digit carries one bit of information) can, on the one hand, be divided into blocks of fixed length, which are then encoded as separate units. Alternatively, the transmission process may be a continuous one, in which bits are introduced into the encoder, and later decoded, individually. The term decision feedback is reserved for block-transmission systems in which a code word of indefinite length is assigned to each possible message block. (Author)

AD-264 748 Div. 30, 27, 10
(TIPSM/REB) OTS price $2.60

Naval Ordnance Test Station, China Lake, Calif.
DIFFERENTIAL THERMAL ANALYSIS AS A RESEARCH TOOL IN CHARACTERIZING NEW PROPULSION SYSTEMS,
by P. G. Rivette and E. D. Besser. Oct. 61, 22p. incl. illus. table (NOTS Technical publication 2748)
(NAVWEPS Rept. 7769) Unclassified report

DESCRIPTORS: (Test methods for *Temperature, Analysis of Heat treatment, Storage of *Solid rocket propellants, Rocket propulsion.) (Instrumentation, Test equipment, Laboratory furnaces, Electrical equipment, Thermocouples.) (Chemical reactions, Transformations, Combustion, *Reaction kinetics.)

Differential thermal analysis (DTA) techniques are applied to the characterization of advanced propellant systems. From the thermogram of a material (propellant or a propellant ingredient), the temperature at which a reaction will rapidly occur can be studied. It is shown how a DTA thermogram can be used to obtain activation energy, E (the energy barrier opposing the reaction), the frequency factor, A (the measure of the probability that a molecule having E will participate in a reaction), and, from the degree of asymmetry of the thermogram, the apparent reaction order. This information (from small samples), along with other thermodynamic properties and theoretical equations relating size and shape to temperature rise, is used in predicting behavior during storage of large propellant motors. The extrapolation is checked by scaled sizes of propellants and cook-off data using derivative differential thermal analysis. (Author)

AD-264 769 Div. 30, 32
(TIPSB/MS) OTS price $9.60

Rand Corp., Santa Monica, Calif.
SIX TASKS IN COMPUTATIONAL LINGUISTICS.
Final rept.,
by K. E. Harper, D. G. Hays and others. Oct 61, 112p. incl. tables, 24 refs. (Research memo. no. RM-2803)
(Contract AF 49(638)737)
(AFOSR-1362) Unclassified report

DESCRIPTORS: (*Machine translation, *Language, Classification, Distribution, Statistical analysis, Coding.) (*Programming, Magnetic tape.) *USSR.

Three linguistic problems are discussed: distributional-semantic classification of Russian words, statistical procedures for the discovery of grammatical transformations, and derivational-family classification of Russian words. A set of programs for management of a file of unedited test on magnetic tape is reported. One program to be included in a set of glossary-management programs, this one an editing program, is described. Text improvements, setting requirements for a text-editing program, are reported. A list of technical notes prepared under the contract is appended. (Author)

AD-264 826 Div. 30
(TIPSB/MS) OTS price $.50

Metals and Ceramics Lab., Wright Air Development Div. Wright-Patterson Air Force Base, Ohio.
A HIGH PRESSURE CELL CAPABLE OF TEMPERATURES TO 1700 C AND PRESSURES TO 20,000 ATMOSPHERES.
Rept. for Sep 60-Feb 61 on Refractory Inorganic Non-Metallic Materials,
by L. B. Robinson, V. W. Vahldiek, and C. T. Lynch. Mar 61, 13p. incl. illus. 13 refs.
(Proj. no. 7350)
(WADD TR 61-128) Unclassified report

DESCRIPTORS: (*High temperature research, *High pressure research, Test equipment, Design.) Materials.

An apparatus has been designed and constructed for the study of high temperature materials under pressure. It consists of a modification of the simple piston-cylinder pressure system for simultaneous pressure and temperature application. The apparatus is capable of subjecting test specimens to pressures up to 20,000 atmospheres and temperatures to 1700 C. Temperatures were obtained by using an internal resistance furnace made of carbon - 10% silicon carbide. A relatively large specimen can be used, since the insulation consisting of mica and boron nitride has a maximum thickness of only 60 mils. The temperature can be accurately monitored and controlled by a unique specimen temperature calibration technique. This high temperature - high pressure cell will be used in sintering, phase transition, and compound formation studies. (Author)

Division 30 - RESEARCH AND RESEARCH EQUIPMENT

AD-264 848 Div. 30
(TIPSE/NTM) OTS price $3.60

Arnold Engineering Development Center, Arnold Air Force Station, Tenn.
COLD DIFFUSION PUMP,
by J. D. Haygood, J. E. Nichols and E. S. J. Wang. Oct 61, 36p. incl. illus. tables (Rept. no. AEDC-TN-61-112)
(Contract AF 40(600)800)
Unclassified report

DESCRIPTORS: (*Diffusion pumps, Vacuum pumps.) (Space environmental conditions, Simulation, Low temperature research.) (Nitrogen, Hydrogen, Helium, Measurement.) Cryogenics,

A novel vacuum pumping device which employs the combined principles of cryopumping and diffusion pumping is described. Because of the extremely low vapor pressure of its working fluid at cryogenic temperatures, such a cold diffusion pump has the potential of achieving an ultimate vacuum exceeding 10 to the -9th power mm Hg. The operating characteristics of an 8-in. experimental cold diffusion pump were studied. The working fluids used were CO2 and NH3, and the cryosurface temperature was maintained with liquid nitrogen. The results are presented in terms of pumping speeds for various noncondensable gases as a function of injection flow rate, nozzle parameters, and limiting pressures. A theoretical analysis of the experimental results is presented. (Author)

AD-264 864 Div. 30, 15
(TIPSP/JDP) OTS price $9.60

Air Force Cambridge Research Labs., Bedford, Mass.
THE FORMALIZATION OF THE FOUNDATIONS OF GEOMETRY WITHIN THE SYSTEM OF SYMBOLIC LOGIC R,
by Michael D. Resnik. Sep 61, 115p. (Rept. no. AFCRL-704)
(Proj. 5632)
Unclassified report

DESCRIPTORS: (Computers, *Programming, *Mathematical logic, *Geometry, Theory, *Computer logic.)

An underlying logic is developed of sufficient strength to handle geometry in a set theoretical manner. The logic is formulated so as to use the subordinate proof technique developed by Fitch (The Ronald Press Co., N. Y., 1952). Axioms for plane geometry are added to this logic and the relations of parallelism betweenness, and congruency are treated. Questions of consistency are discussed. (Author)

AD-264 888 Div. 30, 9, 26
(TIPSM/EJH) OTS price $1.60

Norwegian Defence Research Establishment.
RESEARCH IN SELF-DIFFUSION IN LIQUIDS. THE MANUFACTURE OF MAGNETIC MICROFLOATS FOR DENSITY MEASUREMENTS,
by B. Ottar and N. Sands. 23 May 61, 17p. incl. illus. (Technical rept. no. 2)
(Contract AF 61(052)343; In cooperation with Aeronautical Research Lab., Wright-Patterson Air Force Base, Ohio)
(ARL-162) Unclassified report

DESCRIPTORS: (*Density sensitive indicators, Liquids, Design, Materials, *Buoyant materials, Magnetic materials, Manufacturing methods, Production.) (*Liquids, *Cyclohexanes, *Diffusion, Tracer studies, Density.) (Floats, Glass, Heat resistant glass, *Magnets, Laboratory equipment, Test equipment, Capillary tubes.) Organic solvents.

In connection with diffusion measurements in liquids using heavy isotopes as tracers, a magnetic float method for measuring liquid densities in very small samples was developed. A detailed description of the methods used to make the magnetic microfloats for density measurements in liquid volumes down to 0.03 ml is given; the volume of the float is about 0.020 ml. Although the floats were made to match cyclohexane at 25 C, density 0.775 g/cc, no particular difficulty was encountered in matching the float to, for instance n-hexane (0.657 g/cc at 25 C).

AD-264 955 Div. 30, 20
(TIPSP/MFA) OTS price $1.10

Palmer Physical Lab., Princeton U., N. J.
IBM 650. PROGRAM FOR TWO-BODY KINEMATICS. Technical rept. no. 26 on Cosmic Ray and Elementary Particles Group,
by Kenneth Edwards. 2 Oct 61, 7p. incl. tables.
(Contract Nonr-185806)
Unclassified report

DESCRIPTORS: (Computers, *Data processing systems, *Programming, *Particles, Mass energy relation, Motion, Energy, Kinetic theory, Scattering.) (Neutrons, Pions.) Equations, Tables.)

A program is described for calculating the kinematics of a reaction of the form: particle (1) + particle (2) moves towards particle (3) + particle (4), where particle (2) is at rest in the laboratory. Once the masses of the four particles are specified along with the lab momentum of particle (1), the machine will calculate the total lab energy of particle (1), the velocity of the center of mass, the total energy in the center of mass, the center of mass momentum for the final particles, and the total energies of the final particles in the center of mass system. (Author)

AD-264 968 Div. 30, 14, 26
(TIPSM/EJH) OTS price $9.60

Bjorksten Research Labs., Inc., Madison, Wis.
RESEARCH AT HIGH PRESSURES AND TEMPERATURES. Final rept. 20 Aug 59-31 Oct 60,
by Stanley A. Dunn and George B. Wills. Jan 61, 112p. incl. illus. tables.
(Contract NOrd-19079)
Unclassified report

DESCRIPTORS: (*High temperature research, *High pressure research, *Pressure vessels, Design, Instrumentation, Firing mechanisms, Combustion chamber lines, Materials, Insulating materials, Thermal insulation, Stresses, Mechanical properties, Manufacturing methods, *Filament wound construction.) (High pressure research, *Bibliography.) (*Thermites, Chemical reactions, Gas generating systems, Heat production, Pressure.) *Heat resistant polymers, Resins, Synthetic fibers, Fibers, Glass textiles, *Refractory materials, Silicates, Spheres, Test equipment, Coatings.

Nine pressure vessels were constructed and successfully fired. Although none of these

vessels incorporated optimal prestressing of the wall structure, there is evidence to indicate that an alternate equivalent effect was accidentally achieved in the construction of two of the reactors and that a pressure of approximately 300,000 psi at internal temperatures between 1773 and 1857 C was achieved in both cases. Some progress was made on techniques for pressure measurement. A number of basic techniques necessary to the attainment of high pressures and temperatures in a thick-walled spherical pressure vessel of fiber-glass reinforced plastic were worked out. Equations were derived for the pattern of initial stresses required to cause all elements of a thick-walled spherical pressure vessel to be stressed to the ultimate tensile stress when the internal pressure is raised to the bursting point. (Author)

AD-264 998 Div. 30, 25
(TIPSW/CRJ) OTS price $3.60

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A SOLID STATE MEMORY SYSTEM UTILIZING IMPULSE SWITCHING OF FERRITE CORES,
by V. J. Sferrino. 22 Sep 61, 38p. incl. illus.
(Technical rept. no. 247)
(Contract AF 19(604)7400)
Unclassified report

DESCRIPTORS: (*Data storage systems, *Memory devices, *Ferrite cores, *Switching circuits, *Radar equipment, Design.) (Transistors, Diodes, Pulse amplifiers, Delay lines, Design.) (*Electronic circuits, Trigger circuits, *Printed circuits.) (Ferrite cores, Transistors, Packaging.) Mathematical logic, Ferrites, Amplifiers.

A high speed core memory was completed and tested for applications to radar systems at Lincoln Laboratory. The memory uses impulse switching of ferrite cores and represents a new method of binary information storage. There are 1000 words of 30-bit length organized in a linear selection system. The address is sequential, with a minimum access time to adjacent words of 1.5 microsec. The memory is composed entirely of solid state devices, and contains approximately 2600 diodes, 2700 transistors, 2100 p-n-p-n devices and 84,000 ferrite cores. The system provides access to 20 million bits of information per second when operating at an address rate of 1.5 microsec. (Author)

AD-264 999 Div. 30, 15
(TIPSP/JDP) OTS price $1.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
A WEIGHT FORMULA FOR GROUP CODES,
by Gustave Solomon. 9 Oct 61, 9p. (Rept. no. 47G-1)
(Contract AF 19(604)7400)
(ARPA Order 56-61) Unclassified report

DESCRIPTORS: (*Coding, Theory, Computers, Vector analysis, Polynomials.)

For n odd, let A be any (k,n) group code, i.e. a k-dimensional subset of the vector space of dimension n over the field F of two elements. The weight of a vector is defined to be the number of components in a vector equal to unity. The exponential weight of a vector which is an element of a finite field over F is introduced. Using the general representation of group codes in Solomon (LLGR 47G-0020), a formula is obtained for the exponential weight of a vector as a function of several independent variables, the parameters of the general representation. The coefficients of the formula are obtained using elementary multiplication on the cyclic group of the nth roots of unity. (Author)

AD-265 099 Div. 30, 8
(TIPSA/DLW) OTS price $4.60

Gordon McKay Lab. of Applied Science, Harvard U., Cambridge, Mass.
APPARATUS FOR THE STUDY OF THE PROPERTIES OF ANTENNAS IN A CONDUCTING MEDIUM,
by Keigo Iizuka and Ronald W. P. King. 20 May 61, 41p. incl. illus. tables, 19 refs. (Scientific rept. no. 1)
(Contract AF 19(604)7262)
(AFCRL-898) Unclassified report

DESCRIPTORS: (*Test facilities, *Antennas, Antenna radiation patterns, Electrical properties, *Coaxial cables, Impedance, Dielectric properties, Conductivity, Admittance, Measurement, Test equipment.) (Electromagnetic waves, Very high frequency, Wave transmission, Electromagnetic wave reflections, Measurement.)

The experimental arrangement consists of three major parts, the conducting dielectric medium, the coaxial-line measuring equipment, and the impedance bridge which is used to measure the dielectric constant and the conductivity of the medium. One of the vertical walls of the wooden tank which holds the conducting dielectric is made of an aluminum image plane into which is connected a horizontal coaxial line, the inner conductor of which is extended through the metal plane into the dielectric in the tank. The line is excited by a high power generator at 114 mc. The signal from the current probe which is installed on the antenna is detected by a superheterodyne receiver. (Author)

AD-265 140 Div. 30, 15
(TIPSP/WH) OTS price $5.60

Electronics Research Lab., U. of Calif., Berkeley.
THE MULTIPLE INPUT MINIMAL TIME REGULATOR PROBLEM (GENERAL THEORY).
by J. Wing and C. A. Desoer. 26 July 61, 51p. incl. illus. 20 refs. (Series no. 60, Issue no. 385)
(Grant G-15965)
Unclassified report

DESCRIPTORS: (*Computers, *Control systems, *Servomechanisms, Time, Theory.) (Mathematical analysis, Vector analysis, Matrix algebra.)

The minimum-time regulator problem is considered for a linear time-invariant discrete system whose state transition equation is $\underline{x}_{k+1} = \underline{\underline{A}}\underline{x}_k + \underline{\underline{D}}\underline{u}_{k+1}$. The problem of control is to choose an m dimensional control vector $\underline{u}_{k+1}$ to influence the n dimensional state vector $\underline{x}_{k+1}$ in some prescribed fashion. As an example it may be required to take the initial state $\underline{x}_0$ to some desired target state $\underline{1}$ in the minimum number of sampling periods with the constraint that $\underline{u}_{k+1}$ be from an admissible class of controls. For the minimal time-regulator problem the target state $\underline{1}$ is the equilibrium state $\underline{0}$. The admissible class of controls is taken to be either the whole m dimensional space or a closed bounded, hence compact, convex set Ω which contains the origin. (Author)

AD-265 197 Div. 30, 3, 10
(TIPSM/EJH) OTS price $4.60

Mine Safety Appliances Co., Pittsburgh, Pa.
DEVELOPMENT OF AN ATMOSPHERIC MONITORING SYSTEM.
Final rept., 12 June 58-30 June 61,
by Kenneth E. Ball. 30 June 61, 45p. incl. illus. table.
(Contract AF 04(611)3738)
Unclassified report

DESCRIPTORS: (*Gas detectors, Monitors for Poisonous gases, Design, Operation, Ionization chambers.) (*Rocket fuels, *Rocket propellants, *Rocket oxidizers, Detection.) (Hydrogen compounds, Chlorine compounds, *Fluorides.) (*Nitrogen compounds, *Tetroxides.) (Atmosphere, Contamination.) (*Aerosols, Production, Reagents, Benzyl radicals, Amines, Acids.) *Pentaboranes, *Hydrazines.

Atmospheric monitoring devices sensitized to continuously detect and record toxic and higher concentrations of HF, F2, B5H9, N2H4, NO2 and C1F3 have been developed and engineered. An ionization type analyzer sensitive to finely divided aerosols is used as the detecting instrument. Various amine and acid reagents are used to convert the oxidizers and fuels respectively to aerosols. Response times are in the order of seconds and a high degree of specificity has been attained. (Author)

AD-265 208 Div. 30
(TIPSB/MS) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
EXPERIMENTAL STRESS ANALYSIS OF A SPHERICAL COMBUSTION CHAMBER.
by V. C. D. Dawson, R. H. Waser, and B. J. Noonan. Aug 61, 4p. illus. tables (Ballistics Research rept. 33)
(NAVWEPS Rept. 7319) Unclassified report

DESCRIPTORS: (*Combustion chambers, Spheres, Design, Stresses, Mathematical analysis, Measurement.)

The advantages of spherical combustion chambers, with respect to strength and ignition, make their use particularly desirable for shock tunnels and high speed launchers. The difficulties of design and fabrication have generally limited their widespread application. A spherical type of chamber has been designed and fabricated during the past year. This report describes the experimental stress analysis of the chamber that was made during its acceptance test, together with the subsequent modification of the chamber. (Author)

AD-265 209 Div. 30
(TIPSB/MS) OTS price $4.60

Naval Weapons Lab., Dahlgren, Va.
COMPUTER PROGRAMS FOR ASTRONAUTICS: THE TRANSIT DATA PREPROCESSING PROGRAMS,
by M. J. Shelkey. 13 Oct 61, 39p. illus. (NWL rept. no. 1764)
Unclassified report

DESCRIPTORS: (*Data processing systems, Computers, *Programming, Mathematical analysis.) (Satellite vehicles, Doppler tracking, Data, Coding.)

The Transit data preprocessor programs as of 1 May 1961 are described in detail. The preprocessor is composed of a series of programs used to process the Doppler data received via TWX from the TRANSIT tracking stations. The data are checked for errors and inconsistencies, converted from the raw measured data to values of frequency, corrected for refraction and edited into the format required in the orbit improvement program. (Author)

AD-265 231 Div. 30, 7
(TIPSW/WAW) OTS price $1.60

Material Lab., New York Naval Shipyard, Brooklyn.
DEVELOPMENT OF CONTINUITY TESTER FOR MAGNET WIRE.
Final rept.,
by J. R. Andreotti. 11 Oct 61, 11p. incl. illus.
(Lab. Proj. 4861-F-36)
Unclassified report

DESCRIPTORS: (*Electric wire, Electric insulation, Test equipment, Design, Tests, *Test sets.) (*Magnet coils, Coils, Materials.)

Equipment for testing the insulation continuity of magnet wire is described. The equipment uses a mercury bath through which the wire to be tested is passed. Provision is made for wire speeds of 100 + or - 10 feet per minute and for distinguishing between point discontinuities and wire which is defective along its entire length.

AD-265 257 Div. 30, 13
(TIPSW/DLW) OTS price $1.60

Naval Boiler and Turbine Lab., Philadelphia, Pa.
JERGUSON GAGE AND VALVE COMPANY TRUSCALE REPEATER REMOTE LIQUID LEVEL INDICATORS FOR BOILERS,
by J. Isinger. 14 Aug 61, 16p. incl. illus. tables (Evaluation rept. no. B-365)
Unclassified report

DESCRIPTORS: (*Liquid level gages, Electrical equipment, Remote control systems, Liquid level control, Boilers, Tests.) (Voltmeters, Gages, Roll, Pitch, Calibration, Errors, Reliability, Tests.)

A Truscale repeater was evaluated for remote electrical duplication of steam drum water level as indicated by the pressurized Truscale unit. The repeater duplicated the Truscale pointer position with precision under all conditions up to 15-degree inclinations. Under 30-degree tilt in some directions, accuracy was reduced, but still reasonable considering the size and readability of the repeater scale. Being a commercial version, no shock or vibration tests were made. (Author)

AD-265 265 Div. 30
(TIPSB/LH) OTS price $2.60

Air Force Office of Scientific Research, Washington, D. C.
LONG RANGE RESEARCH IN THE INFORMATION SCIENCES,
by Harold Wooster. 1961, 24p. (Rept. no. AFOSR 1571)
Unclassified report

Presented at the Science and Engineering Symposium 3rd and 4th Oct 1961, at San Francisco, Calif.

DESCRIPTORS: (*Symposia, Data processing systems, Data storage systems of Scientific reports, *Documentation, Processing, Theory.)

A new method for automatically collecting, storing, and retrieving scientific information is described. Further sophistication of the process enables it to translate, screen, index, and requisition such information. A number of problems are discussed, such as problems of information analysis, problems of people, of computers, and a look is taken at long range research into information sciences. (Author)

AD-265 268 Div. 30
(TIPSP/MFA) OTS price $9.60

Purdue U. School of Electrical Engineering, Lafayette, Ind.
A STUDY OF DIGITAL ADAPTIVE CONTROL SYSTEMS. PART II. OPTIMUM DESIGN OF LINEAR MULTIVARIABLE DIGITAL CONTROL SYSTEMS,
by J. T. Tou and P. D. Joseph. Aug 61, 111p. incl. illus. tables, 43 refs. (Technical rept. no. 102; TR-EE61-7; PRF 2327, pt. 2)
(Contract Nonr-110018, Proj. NR 049-150)
Unclassified report

DESCRIPTORS: (*Digital systems, *Control systems, Linear systems, Design, Costs.) (Dynamics, Programming, Data storage systems, Digital computers, Feedback, Noise, Measurement.) (Functions, Statistical functions, Sampling, Statistical processes, Probability, Matrix algebra.)

A method for determining the optimum linear digital control system with respect to a quadratic performance criterion, when additive disturbances are present, is described. A method of designing multivariables, time varying and/or final value control systems is presented. This method of design is also advantageous when optimum control must be maintained during the initial start up transient as no assumption concerning steady state was made. The method of estimating the state variables is extended to the case of independent random sampling but the portion concerned with optimum control of a system constrained at the output is only extended to certain special cases. The design method is also extended to adaptive control systems for the case where perfect identification is possible. (Author)

AD-265 284 Div. 30, 8
(TIPSW/CCD) OTS price $1.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
ELECTRONIC SHOP AN/MRM-3,
by John J. Guba. Sep 61, 14p. incl. illus.
(Rept. no. RADC TR 61-198)
Unclassified report

DESCRIPTORS: (Test equipment, *Maintenance equipment, *Electronic equipment, *Test facilities, Packaged circuits, Design.) (Communication equipment, Radio equipment, Radar equipment, Radio navigation, Radar navigation, Packaged circuits, Installation, Tests, Maintenance.)

The electronic Shop AN/MRM-3 is a highly mobile, air-transportable electronic equipment maintenance facility, developed for Air Force Communications Service (AFCS), to provide servicing and maintenance for Projects Two Wheels and Four Wheels equipments. These RADC-developed projects consist of fifteen different navigation and communication facilities which are presently being used by AFCS to support air operations under emergency or austere conditions. A description is given of the AN/MRM-3, with primary emphasis on the development in the mechanical area. The mobility and air transportability characteristics of the Electronic Shop AN/MRM-3 are excellent. Tests have determined that general standard cargo types of military vehicles and cargo aircraft currently in use can adequately support deployment of this facility. The configuration of the Electronic Shop results from the application of design techniques to provide the flexibility required, which is dependent on the type of electronic equipment to be transported and the intended use of the facility. (Author)

AD-265 330 Div. 30
(TIPSB/MS) OTS price $1.60

Washington U., Seattle.
AN IBM TYPE 709 GRADE PREDICTION SYSTEM PROGRAM MODIFIED TO REPLACE PREDICTOR 11 WITH INTERMEDIATE MATHEMATICS,
by George R. Burket, Jack Pueschner, and Barbara J. Jaeger. Sep 61, 17p. incl. tables.
(Contract Nonr-47708)
Unclassified report

DESCRIPTORS: (*Data processing systems, Programming, Control.) (Magnetic tape, Punched card methods, Coding.) Mathematical prediction.

AD-265 332 Div. 30, 14
(TIPSB/MS) OTS price $1.60

Rock Island Arsenal Lab., Ill.
EVALUATION OF SONIC SHEAR STABILITY TEST METHODS - LITERATURE REPORT,
by R. LeMar. 29 Aug 61, 20p. incl. illus. table, 19 refs. (RIAL rept. no. 61-3178)
(Proj. 5B93-21-061)
Unclassified report

DESCRIPTORS: (*Hydraulic oils, Polymers, Physical properties, Viscosity, Stability, *Test methods, Tests.) (Sound, Oscillators, *Shear stresses, Test methods.)

There is general agreement among the conclusions of studies on sonic shear breakdown techniques for polymer-thickened hydraulic oils. These conclusions vary only in degree, i.e., from those indicating that this technique is promising, to recommendations that it should replace present-day mechanical pump methods. Sonic shear test methods have a number of advantages over existing pump shear methods; These are (1) they are much more rapid, (2) they require smaller test samples, and (3) they are apparently not subject to the frequent mechanical failure of some types of pump test units. In addition, sonic test repeatability is nearly as good as that of the best pump methods. With reference to the nature of the effects on the test fluid, it appears that sonic irradiation and mechanical pump shearing action produce a similar if not identical type of deterioration of polymer-thickened oils. Approximate mathematical relationships can be found relating the rate-of-breakdown (of fluids) in the sonic irradiation unit to that found in a given mechanical pump test unit. The sonic shear unit most extensively used for hydraulic oil studies is the Raytheon Model DF-101 Sonic Oscillator. (Author)

AD-265 333 Div. 30
(TIPSB/LH) OTS price $7.60

Rome Air Development Center, Griffiss Air Force Base, N. Y.
DOCUMENT DATA PROCESSING CENTRAL AN/GSQ-11A(V)

(MINICARD).
Categories I and II test rept.,
by N. Miullo. Sep 61, 68p. incl. illus. tables.
(Rept. no. RADC TR 61-137)
(In cooperation with Eastman Kodak Co.,
Rochester, N. Y., Contract AF 30(602)1698)
Unclassified report

DESCRIPTORS: (*Documentation, *Processing, Scientific reports.) (Data storage systems, *Data processing systems, Computers, Design, Tests.)

Results are presented of Categories I and II (AFR 80-14) testing of the Document Data Processing Central AN/GSQ-11A(V) (Minicard), under the cognizance of Directorate of Intelligence and Electronic Warfare, Rome Air Development Center (AFSC), at Offutt Air Force Base, Nebraska, during the period 4 January through 10 March 1961. The report describes test procedures; presents data on production, idle and down time; identifies and analyzes deficiencies in equipment and recommends solutions therefor; and finally, discusses over-all test results. As a consequence of this testing, it was determined that the AN/GSQ-11A(V) is operationally effective as a data processing system. (Author)

AD-265 350 Div. 30, 9
(TIPSP/WH) OTS price $3.60

Space Technology Labs., Inc., Los Angeles, Calif.
HIGH MACH NUMBER AND MATERIALS RESEARCH PROGRAM.
Semiannual technical rept. 1 Jan-30 June 58,
by J. Logan. 20 July 58, 31p. incl. illus.
(Rept. no. GM-TR-0165-00440)
(Contract AF 04(647)165)
Unclassified report

DESCRIPTORS: (*Test facilities, Laboratory equipment, *Aeronautical laboratories, Aerodynamics, Materials.) (Laboratory equipment, *Shock tubes, Electric arcs.) (Heat transfer, Mach number, Guided missile noses.)

Progress in high mach number and materials research is described. Laboratory construction was completed and the laboratory was occupied. Basic shock tube equipment was installed, and initial shock tube tests were undertaken. Successful operation of arc units was achieved and detailed arc investigations are now being undertaken. Shock tunnel and arc tunnel equipment is being installed. (Author)

AD-265 394 Div. 30
(TIPSW/RD) OTS price $7.60

Chesapeake Bay Inst., Johns Hopkins U.,
Annapolis, Md.
AN INDUCTION CONDUCTIVITY TEMPERATURE INDICATOR,
by E. W. Schiemer and D. W. Pritchard. Oct 61,
75p. incl. illus. (Technical rept. no. 25;
Reference no. 61-4)
(Contract Nonr-24820)
Unclassified report

DESCRIPTORS: (Electric bridges, Temperature, Measurement, Instrumentation, Thermistors, *Resistance thermometers, Temperature sensitive elements.) (Conductivity, Measurement, Sea water.) (*Resistance thermometers, Shipborne.)

An induction conductivity temperature indicator (ICTI) is described. It consists of two self-balancing digital direct readout indicators, one for conductivity and the other for temperature, with underwater sensing elements and 200 feet of cable. Conductivity is sensed by inducing a voltage into the sea water by transformer action and measuring the induced current with a second transformer, the sea water forming a single turn linking both transformers. The voltage output of the second transformer is then a function of the sea water conductivity and is measured by a servo balanced a.c. potentiometer. Temperature is sensed by a thermistor bead having a time constant of less than one second, and is measured by a servo balanced Wheatstone bridge. (Author)

AD-265 397 Div. 30
(TIPSP/JDP) OTS price $1.60

Electric Boat Div., General Dynamics Corp.,
Groton, Conn.
A COMPARISON OF RELIABILITY IN COMPUTER SYSTEMS UTILIZING DUPLEX AND POLYMORPHIC CONCEPTS.
Rept. on Proj. SUBIC,
by Thomas M. Downie and John J. Hanrahan.
3 May 61, 12p. incl. illus. tables (Rept. no. U414-61-011)
(Contract Nonr-251200)
Unclassified report

DESCRIPTORS: (*Digital computers, Reliability, Electronic circuits, Operation, Costs.) (Submarines, Control Systems.)

The reliability of duplex and polymorphic computers is discussed. Within the limits of the study assumption, it was found that: (1) the polymorphic type of computer configuration is more reliable than the equivalent duplex when both types are using equally reliable functional units, and (2) the polymorphic computer will cost less than an equivalent duplex when both systems are designed to the same level of reliability. (Author)

AD-265 412 Div. 30, 8, 6, 19
(TIPSW/DLW) OTS price $14.50

New Mexico U. Engineering Experiment Station,
Albuquerque.
AN ACOUSTIC SIMULATOR FOR MODELING BACKSCATTER OF ELECTROMAGNETIC WAVES,
by Allen R. Edison, Sep 61, 217p. incl. illus. tables, 38 refs. (Technical rept. no. EE-62)
(Contract N123-60530-18138A)
Unclassified report

DESCRIPTORS: (*Test facilities, *Electromagnetic waves, Frequency modulation, Electromagnetic wave reflections, Wave transmission, Attenuation, *Scattering, Wave analysis, Statistical analysis, Design, Simulation.) (Water tanks, Underwater sound, *Acoustics, Test methods, Test equipment.) (Radar pulses, Doppler radar, Radar echo areas, Radar equipment, Radar altimeters, Navigation, Electronic equipment, Test methods.)

Model experiments are commonly employed in situations where full scale experiments are uneconomical and where exact theoretical analysis is very difficult. A study was made to develop techniques of using high frequency acoustic waves in water to simulate electromagnetic waves in air. The simulation technique is applied to radar and altimeter design problems as an aid in determining system parameters and to evaluate the performance of signal processing circuitry. It was determined that many of the statistical characteristics of electromagnetic waves scattered from terrain, such as: (1) the angular dependence of the mean backscattered power, (2) the range of fading, and (3) the rate of fading, can be duplicated using appropriate targets and acoustic waves in water. (Author)

AD-265 415 Div. 30, 9
(TIPSW/CCD) OTS price $1.60

Naval Ordnance Lab., White Oak, Md.
ACCELERATION-COMPENSATING PRESSURE TRANSDUCERS FOR SURFACE-PRESSURE MEASUREMENTS,
by David Levine. Aug 61, 6p. illus. table.
(Ballistics Research rept. 27)
(NAVORD Rept. 6834) Unclassified report

DESCRIPTORS: (*Transducers, Pressure, Materials, *Strain gages, Calibration, Measurement, Barium compounds, Titanates, Polarization, Aerodynamic configurations, Re-entry aerodynamics, Shock tubes, Wind tunnels, Tests.)

An acceleration-compensating pressure transducer was developed for use in the U. S. Naval Ordnance Laboratory high-performance shocktube wind tunnels to operate at pitot pressures as high as 1,000 psi. The transducer consists of two polarized barium titanate elements whose outputs are closely matched. The elements are connected electrically to cancel mechanical forces simultaneously detected by both elements. Only one element is exposed to the flow. Tests in the 6-in. Shocktube, and in the Shocktube Wind Tunnels have shown that the transducer gives accurate pressure information for the aerodynamic conditions generated in these facilities. (Author)

AD-265 416 Div. 30
(TIPSW/NTM) OTS price $2.60

Naval Ordnance Lab., White Oak, Md.
PRESSURE-GAGE DESIGN FOR THE MEASUREMENT OF PRESSURES IN SHOCKTUBE WIND TUNNELS, SHOCKTUBES AND GUNS,
by V. C. D. Dawson. Aug 61, 23p. incl. illus.
(Ballistics Research rept. 36)
(NAVWEPS Rept. 7326) Unclassified report

DESCRIPTORS: (*Pressure gages, Strain gages, Design.) (Shock tubes, Pressure, Wind tunnels, Measurement, Hypervelocity guns.) Circuits.

The pressure-gage design and circuitry of the piston-type strain gages are described. They are used by the Naval Ordnance Laboratory for the measurement of pressures in shocktube wind tunnels, shocktubes and guns. The pressures measured with gages of this type cover the range from a few psi to over 100,000 psi. (Author)

AD-265 438 Div. 30
(TIPSB/MS) OTS price $9.60

Science and Tech. Section, Air Information Div., Washington, D. C.
L. I. SEDOV. A SURVEY AND EVALUATION OF HIS WORKS AND ACTIVITY.
25 Sep 61, 118p. 415 refs. (AID rept. no. 61-136)
Unclassified report

DESCRIPTORS: (*Bibliography, Astronautics, Satellite vehicle research.) (*Scientific personnel, Scientific research, Scientific reports.) USSR.

The report is divided into four chapters. Chapter I presents the significant dates in the life of L. I. Sedov and includes a biography based on sketches published by the Soviet Academy of Sciences, Moscow University, the Large Soviet Encyclopedia, and other publications. Chapter II reviews L. I. Sedov's writings in chronological order, providing brief annotations and evaluations. Important works by Sedov included in Theoretical Hydromechanics (a TsAGI publication) or published by Oborongiz (the military publishing house), for examination, are included in the listing. Evaluations of two of Sedov's monographs, Two-dimensional Problems in Aerodynamics and Hydrodynamics, and Similarity and Dimensional Methods in Mechanics, are given, as these books represent a composite of the work done by Sedov and his colleagues. Chapter III consists of supplementary bibliographies of papers and studies either sponsored by Sedov or mentioning him. Chapter IV sums up the findings of the report, based on the literature survey and remarks of observers at several recent international science conferences. In conclusion, an attempt is made to evaluate L. I. Sedov's scientific contributions and his present role in Soviet scientific activities and propaganda. (Author)

AD-265 479 Div. 30, 27
(TIPSW/PLW) OTS price $1.00

National Aeronautics and Space Administration, Washington, D. C.
LIQUID-HYDROGEN-FLOWMETER CALIBRATION FACILITY; PRELIMINARY CALIBRATIONS ON SOME HEAD-TYPE AND TURBINE-TYPE FLOWMETERS,
by Herbert L. Minkin and Howard F. Hobart.
Oct 61, 40p. incl. illus. (Technical note D-577)
Unclassified report

Also available from NASA, Wash., 25, D. C. as NASA Technical note D-577.

DESCRIPTORS: (*Flowmeters, Liquid rocket propellants, Hydrogen, Liquefied gases, Calibration, *Test facilities, Instrumentation, Design.)

Construction details, instrumentation, and operating techniques are described for a facility that will accept flowmeters up to 1.5-inch pipe size and that can maintain liquid-hydrogen flow rates up to 1 pound per second for 3 minutes. The probable error of calibration is 1/4% of the flow rate for flow rates between 0.05 and 1 pound per second. Preliminary tests of an orifice plate and a nozzle indicate that the same correlation of discharge coefficient with Reynolds number applies for liquid hydrogen as for water. Preliminary tests of several commercially available turbine-type meters show that the calibration constant (pulses per unit volume) for liquid hydrogen will differ, on the average, about 1.0% from the value for water; the difference is not of the same sign for different meters. (Author)

31. SHIPS AND MARINE EQUIPMENT

AD-264 813 Div. 31
(TIPSE/NTM) OTS price $2.60

David Taylor Model Basin, Washington, D. C.
A METHOD FOR ELIMINATING THE EFFECT OF END CONDITIONS ON THE STRENGTH OF STIFFENED CYLIN-

DRICAL SHELLS,
by Robert F. Keefe and Robert D. Short, Jr. Sep 61, 19p. incl. illus. tables (Rept. no. 1513)

Unclassified report

DESCRIPTORS: (Hydrostatic pressure, Cylindrical bodies, Design, Rings, Stresses, Measurement, *Structural shells, Reliability, *Stiffened cylinders.)

A pair of stiffened cylinders was subjected to external hydrostatic pressure to establish the adequacy of a design procedure for eliminating the effect of end conditions on strength. The cylinders were machined from a thick tube and were identical to those described in TMB Report 1326 except for the size and spacing of the frames and the thickness of the shell at the ends. The cylinders failed by axisymmetric shell yielding in the second full-length bay at identical collapse pressures. Test results indicated that, with these end conditions, the collapse pressure could be increased by 4 percent over that for a similar model in which the first bay length was two thirds of the length of the others, and failure could be shifted away from the ends of the cylinder. (Author)

AD-264 818 Div. 31, 9
(TIPSP/WH) OTS price $8.60

Technical Research Group, Syosset, N. Y.
LATERAL STABILITY AND MOTIONS OF HYDROFOIL CRAFT IN SMOOTH WATER.
Final rept.,
by Harry S. Bluston and Paul Kaplan. 31 July 61, 97p. incl. illus. tables (Rept. no. TRG-141-FR)
(Contract Nonr-317800)

Unclassified report

DESCRIPTORS: (*Hydrofoils, *Hydrofoil boats, *Stability (Lateral), Stabilization, Motion, Water, Water waves, Cavitation.) (Mathematical analysis, Differential equations, Hydrodynamics, Transformations (Mathematics), Digital computers.

Starting from the linearized equations for small disturbances, the lateral motion of a submerged hydrofoil system is described by a set of transfer functions whose poles determine the system stability. Approximations to the poles are obtained in terms of the system hydrodynamic derivatives. By means of a digital computer the effect of parameter variations on the poles are studied for 50 ton and 110 ton craft, thereby illustrating the effect of these changes on the craft stability. The transfer function zeros are obtained in terms of the control and hydrodynamic derivatives to complete the system analysis. Using the poles and zeros previously obtained, means for automatic stabilization of the system are discussed and gain requirements are related to configurational changes. (Author)

AD-265 312 Div. 31, 9
(TIPSM/BRW) OTS price $4.60

David Taylor Model Basin, Washington, D. C.
THE EFFECTS OF SCALE AND TOWING SYSTEM ON WAVE TESTS OF SMALL SHIP MODELS.
by Howard R. Reiss, May 61, 45p. incl. illus. tables (Rept. no. 1039)

Unclassified report

DESCRIPTORS: (*Ship models, Cargo ships, Model basins, Towed bodies, Photographic analysis, Motion, Ocean waves, Water waves, Stability, Stability (Longitudinal), Hydrodynamics.) Test facilities, Test methods, Test equipment.

To investigate experimentally the effect of scale on motions of ship models in waves, two different scale models of the motor ship San Francisco were tested. Although within the limits of the investigation there were no differences in the behavior of the models that could be ascribed to the effect of scale, several very noticeable effects were found that resulted from the dynamics of the towing system employed. (Author)

AD-265 425 Div. 31
(TIPSM/BRW) OTS price $6.60

Bureau of Ships, Washington, D. C.
SHOCK DESIGN OF SHIPBOARD EQUIPMENT. PART I. DYNAMIC DESIGN-ANALYSIS METHOD,
by R. O. Belsheim and G. J. O'Hara. May 61, 61p. incl. illus. tables, 33 refs. (NAVSHIPS 250-423-30)

Unclassified report

DESCRIPTORS: (*Naval vessels, Ships, Submarines, *Naval equipment, Shipborne, *Shock resistance.) (Foundations (Structures), Naval equipment, Design.) (Shock, Analysis, Underwater explosion damage, Tests.) (Structures, Stresses, Mathematical analysis, Matrix calculus.)

A design-analysis method is presented for the calculation of the shock response of naval shipboard equipments which are not installed on non-linear shock or vibration mounts. It is essentially a simplified modal analysis method where the design shock inputs have been empirically obtained from realistic underwater explosion tests, as reinforced by information obtained from theoretical and laboratory studies. The method allows variations in the complexity of analysis dependent upon the importance classification of the equipment by the Navy. Differing energy-absorption capacities for different geometries and loadings, when some plasticity can be allowed, is permitted by the use of an effective yield stress as the failure criterion. Several simple numerical examples are worked out in detail closely following the step-by-step procedure outlined (complete with appropriate formulas) in the main body of the text. (Author)

32. MISCELLANEOUS ARTS AND SCIENCES

AD-264 714 Div. 32
(TIPSB/CCH) OTS price $10.10

Lincoln Lab., Mass. Inst. of Tech., Lexington.
UNCLASSIFIED PUBLICATIONS OF LINCOLN LABORATORY.
15 July 61, 120p.
(Contract AF 19(604)7400)

Unclassified report

DESCRIPTORS: (*Reports, Conferences, Instruction manuals, Translations, *Military publications, *Scientific reports.) (*Scientific research, Military research, Electronics, Communication systems, Radar, Radio, Computers, Semiconductors.)

AD-265 335 Div. 32
(TIPSB/LH) OTS price $4.60

Rand Corp., Santa Monica, Calif.
A SELECTED LIST OF UNCLASSIFIED PUBLICATIONS OF THE SOCIAL SCIENCE DEPARTMENT THE RAND CORPORATION. 1948-1961.
15 Sep 61, 48p. (Research memo. no. RM-1403-8)
(Contract AF 49(638)700)
Unclassified report

DESCRIPTORS: *Scientific reports, *Indexes, *Social sciences.

33. TRANSPORTATION

AD-264 821 Div. 33
(TIPSB/MS) OTS price $8.10

United Research Inc., Cambridge, Mass.
FORECAST OF LOSSES INCURRED BY U.S. COMMERCIAL AIR CARRIERS DUE TO INABILITY TO DELIVER PASSENGERS TO DESTINATION AIRPORTS IN ALL-WEATHER CONDITIONS: 1959-1963.
Mar 61, 85p. incl. illus. tables.
(Contract FAA/BRD-309)
Unclassified report

DESCRIPTORS: (*Air transportation, Transport planes, Flight, Costs, Climatic factors.)

The findings indicate that U.S. airlines incur losses of approximately $55 million a year due to flight disruptions in periods when weather conditions are below authorized limits. Due to increased traffic and increases in the costs of operating aircraft, these losses will increase to over $65 million by 1963. The growing proportion of jet aircraft in the carriers' fleets is one of the major factors accounting for the cost increases since costs of delay are far greater for jet aircraft than for piston aircraft because of the higher hourly operating expense of the former. The losses take the form of (1) cash losses when airlines are forced to cancel, delay or divert their schedules, (2) short and long term costs resulting from landing accidents, and (3) losses from reduction in the demand for air travel due to its present unreliability in bad-weather periods. The costs considered in this report were of an incremental and direct nature only. If flight depreciation expense and all indirect and overhead expense were allocated to the aircraft time consumed in delays, diversions and cancellations, the costs would have been considerably higher than those shown. (Author)

NON-MILITARY AND OLDER MILITARY RESEARCH REPORTS

*Descriptors marked with an asterisk will be included in the cumulative indexes.

ASTRONOMY

PB 158 774 $9.60

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
EARTH'S GEOMAGNETICALLY TRAPPED CORPUSCULAR RADIATION, by Donald Gilbert Carpenter. Master's thesis. Mar 60, 111p. 123 refs. GNE-60-3; AD-236 493.

DESCRIPTORS: *Ionosphere, Particles, *Terrestrial magnetism, *Van Allen radiation belt, Cosmic rays, Measurement, Rockets, Satellite vehicles, Balloons.

The data concerning the entrapped corpuscular radiation surrounding the Earth are summarized. Theories providing possible explanations for the existance of this radiation, as well as the connections between it and such phenomenae as aurora and magnetic storms, are discussed. The data collecting methods, such as rockoons, balloons, nuclear detonations, rockets, and satellites, are referred to by experiment. The special Van Allen belt environmental problems of corpuscular and electromagnetic radiation, temperature, and electrostatic and magnetic effects are considered. Space vehicle-borne nuclear reactor contribution is discussed. (Author)

AD-258 314 $3.60

Ohio State U. Research Foundation, Columbus.
ON THE ANALYSIS OF RADIO ASTRONOMICAL OBSERVATIONS MADE WITH HIGH RESOLUTION RADIO TELESCOPE ANTENNAS, by H. C. Ko. Scientific rept. no. 1 on Contract AF 19(604)4079. Feb 61, 33p. 12 refs. RF Proj. 844; Rept. no. 21; AFCRL 331.

DESCRIPTORS: *Radio astronomy, Antennas, Radio waves, *Extraterrestrial radio waves, Statistical processes, *Astronomical data, Analysis, Polarization, Temperature, Brightness, Antenna radiation patterns, Density, Mathematical analysis.

The concepts and formulae needed for the interpretation of radio astronomical observations made with high resolution radio telescope antennas are discussed. General relations concerning the reception of partially polarized radio waves are derived. The relation between the observed antenna temperature and the brightness temperature of a radio source, and the relation between the observed flux density and the true flux density of a radio source are shown. Correction factors for the conversion are derived for two simple radio source models, a circular disk of uniform brightness distribution and that of a Gaussian brightness distribution. (Author)

PB 153 419 $2.60

Radio Observatory, Calif. Inst. of Tech., Owens Valley.
THE DISCRETE SOURCES OF COSMIC RADIO EMISSION, by J. G. Bolton. [1960] 25p. 21 refs. AD-248 896.

DESCRIPTORS: *Radio astronomy, Sources, Identification systems, Radio interferometers, Determination, Galaxies, Brightness, Novae, *Extraterrestrial radio waves, Supernovae, Interferometers

One of the principal problems in the radio astronomy of the discrete sources is their identification with visible objects. Identification is necessary in most instances to determine the distance of a source and thus its intrinsic luminosity. It is of assistance in deciding the probable mechanism for the radio emission. Identification of a reasonable sample of radio sources should be made prior to speculations from statistical studies of the radio sources as a class. A proper identification can be obtained in a number of ways, depending on the particular circumstances. In the case of a planet, detection of the motion is sufficient confirmation of radio emission. Both the radio spectrum and size can be used to establish identification of emission nebulae. Where a 21-cm absorption spectrum is obtained, it may offer definite evidence of identification in the case of a galactic object. In the great majority of cases, the prime evidence for identification is a precise position of the radio source. (Author)

PB 153 418 $1.10

Radio Observatory, Calif. Inst. of Tech., Owens Valley
TWO-ELEMENT INTERFEROMETER FOR ACCURATE POSITION DETERMINATIONS AT 960 MC/S, by Richard B. Read. [Rept. on Contract Nonr-220(19)]. 1960, 10p. 4 refs. AD-248 897.

DESCRIPTORS: *Position finding, *Radio waves, *Parabolic antennas, *Radio interferometers, Measurement, Interferometers, Antennas, Ultra high frequency, Mathematical analysis, Sources.

A 960 mcs two-element interferometer using the twin 90-foot steerable paraboloids of the California Institute of Technology Radio Observatory is described. The response of the associated receiving equipment as it applies to the interferometric position measurements is analyzed in some detail, and an advantage of not rejecting the image response of the receiver is mentioned. Finally, a brief account is given of the various ways the interferometer may be used to measure right ascensions and declinations with both an east-west and a north-south baseline. (Author)

PB 158 739 $1.60

Naval Medical Research Lab., New London, Conn.
THE RELATIONSHIP OF TATTOOS TO PERSONAL ADJUSTMENT AMONG ENLISTED SUBMARINE SCHOOL VOLUNTEERS, by Richard P. Youniss. Rept. on Project NM 23 02 20. 01.07. 17 Sep 59, 14p. 5 refs. Rept. no. 319, Vol. 18, no. 14; AD-232 988.

DESCRIPTORS: *Naval personnel, *Submarine personnel, *Adjustment (Psychology), Anxiety, *Personality tests, Skin, Discoloration, *Behavior.

The question of whether enlisted volunteers for Submarine School who have tattoos show a poorer level of personal adjustment than those without was examined. As determined from comparison of scores on the Personal Inventory Barometer, a questionnaire derived from the Taylor Scale of Manifest Anxiety, the following results were obtained: (1) subjects with 2 or more tattoos demonstrate a lower level of personal adjustment than do those with no tattoos or with one tattoo; (2) subjects with one tattoo do not differ from those with no tattoos in terms of test indices of personal adjustment; and (3) subjects who express a desire for future tattoos show greater personal maladjustment and conflict than do those who deny such a wish. A possible theoretical explanation of these results is presented together with implications for further research in this relatively unexplored area. (Author)

Personnel and Training

AD-262 779 repriced $2.00

New York U., N. Y.
RESPONSE MODE, PACING AND MOTIVATIONAL EFFECTS IN TEACHING MACHINES, by Robert E. Silverman and Millicent Alter. Rept. on Contract N61339-507. 16 June 61, 76p. 9 refs. Technical rept. NAVTRADEVCEN 507-3.

DESCRIPTORS: *Teaching machines, Training devices, Theory, Learning, Effectiveness, Test methods, Tests, Test reactions, Personnel, Programming,. Naval personnel.

Three experiments were performed to study the effects of response mode; one experiment was done to study pacing and one experiment dealt with the motivational effects of teaching machines. The first three experiments indicated that requiring the student to make an overt response does not facilitate programmed learning, nor is the constructing of a response, whether it be overt or covert, necessarily advantageous. The fourth experiment indicated that pacing will not impair performance if care is taken to insure optimal pacing rates. The fifth experiment gave no evidence of motivational effects in teaching machines: programmed textbooks were as effective as teaching machines. (Author)

PB 152 924 $8.60

Office of Naval Research, Washington, D. C.
TRI-SERVICE CONFERENCE ON STAFFING STANDARDS, WASHINGTON, D. C., APRIL 19, 1960. Apr 60, 100p. 3 refs. ONR Symposium rept. ACR-51; AD-254 526.

DESCRIPTORS: *Conference, *Job analysis, *Military personnel, Military requirements, Standards, Air Force, Army, Navy

The agenda for the third tri-service conference was developed around the topic of methods and techniques for determining staffing standards in military organizations. The general objectives were: (1) To provide for the exchange of research data and related information pertinent to the improvement of techniques and methodology for developing staffing criteria. (2) To identify research areas where additional analyses are needed to improve research either in applied fields or in the basic behavioral sciences. The schedule was the same as for the earlier conferences: on the first day each service made a two-hour presentation, and on the second day a small group of military representatives discussed in detail their technical problems in the area under discussion and their plans for future research. This group also interacted with consultants in the field who made oral presentations. (Author)
(See also PB 142 894)

PB 158 825 $9.10

University of Southern California [Los Angeles].
SHIPBOARD OBSERVATION OF ELECTRONICS PERSONNEL: BRIEF DESCRIPTIONS OF RELATED ELECTRONICS JOBS, by William W. Grings. Technical rept. no. 5 on Contract Nonr-228(02). Apr 53, declassified 15 Dec 53. 103p. AD-16 301.

DESCRIPTORS: *Naval personnel, *Job analysis, Maintenance personnel, *Electronic equipment, Shipborne, Operation, Maintenance, Personnel.

The duties of the electronics technician (ET), sonarman, radarman, radioman, and fire controlman are described, and the areas of overlap between the job of the ET and the other 4 jobs are discussed.

PB 158 823 $6.60

University of Southern California [Los Angeles].
SHIPBOARD OBSERVATION OF ELECTRONICS PERSONNEL: IMPLICATIONS FOR THE TRAINING OF ELECTRONICS PERSONNEL, by William W. Grings. Technical rept. no. 3 on Contract Nonr-228(02). Feb 53, declassified 15 Dec 53. 68p. AD-16 346.

DESCRIPTORS: *Naval personnel, *Job analysis, Attitudes, *Electronic equipment, Shipborne, Training, Maintenance, Maintenance personnel, Personnel.

Data are presented concerning the kinds and amounts of electronics maintenance training available on shipboard. Problems attendent to such training are discussed. The attitude of electronics technicians was considered in relation to (1) the relevance of curriculum topics to their jobs, (2) specialization, and (3) nontechnical aspects of ET training.

PB 158 826 $6.60

University of Southern California [Los Angeles]. SHIPBOARD OBSERVATION OF ELECTRONICS PERSONNEL: IMPLICATIONS OF CERTAIN OPERATIONAL AND ADMINISTRATIVE PROBLEMS, by William W. Grings. Technical rept. no. 6 on Contract Nonr-228(02). June 53, declassified 15 Dec 53. 68p. 13 refs. AD-15 385.

DESCRIPTORS: *Naval personnel, *Electronic equipment, Shipborne, Maintenance, *Job analysis, Maintenance personnel, Personnel.

Detailed observations were made of the electronics personnel aboard 20 ships of the destroyer class. Reports are presented on the administrative control of the electronics technicians (ET) team; internal organization of the ET team; the leading ET's; the electronics material officer; the role of the officers from the Captain down through department and division officers; knowledge of ET's job; methods of relaying information; delegation of responsibilities toward equipment; combining ratings; materiel problems affecting maintenance; and personnel turnover in the Navy.

PB 158 824 $9.10

University of Southern California [Los Angeles]. SHIPBOARD OBSERVATION OF ELECTRONICS PERSONNEL: SHIPBOARD ACTIVITIES OF ELECTRONICS TECHNICIANS, by William W. Grings. Technical rept. no. 4 on Contract Nonr-228(02). Mar 53, declassified 15 Dec 53. 102p. AD-16 345.

DESCRIPTORS: *Naval personnel, *Job analysis, *Electronic equipment, Shipborne, Maintenance personnel, Maintenance.

The shipboard activities of the electronics technician (ET) are described with respect to the general maintenance situation, material and behavioral factors, and conditions which limit electrical maintenance. The critical requirements of the ET are evaluated in terms of general abilities, job knowledge, and skills.

BIOLOGICAL SCIENCES

AD-261 906 repriced $0.75

Behavioral Sciences Lab., Aerospace Medical Div., Wright-Patterson Air Force Base, Ohio. THE EFFECT OF TRANSIENT WEIGHTLESSNESS ON VISUAL ACUITY, by Leroy D. Pigg and William N. Kama. Rept. on Human Factors in Advanced Flight. Mar 61, 23p. 4 refs. WADD Technical rept. 61-184.

DESCRIPTORS: *Space flight, *Weightlessness, Physiology, *Visual acuity, Measurement, *Space medicine, Astronautics, Stress (Physiology), Space environmental conditions, Gravity, Tests.

Visual acuity was measured on subjects while they were exposed to short periods of weightlessness aboard an aircraft flown through "zero-g" trajectories involving transition from 1 g to 2-1/2 g to zero g. Monocular and binocular acuity of near and far vision were measured on both Snellen and checkerboard targets. Control measurements were made on the ground and inflight at 1 g in counter-balanced sequence with the zero-g measurements. Results show that the weightless environment produced for this study has a detrimental effect on visual acuity as measured. The decrement is not considered to have practical significance. (Author)

AD-257 439 $1.10

Kansas State U. [Manhattan]. MECHANISM OF VIRUS INFECTION: BACTERIOPHAGE-HOST INTERACTIONS, by A. Eisenstark. Final rept. (Technical rept. no. 3) 1 Apr 53-31 Aug 59, on Contract Nonr-1170(00). [1959] 4p. 16 refs.

DESCRIPTORS: Virus diseases, *Bacteriophages, Xanthomonas, Salmonella, Biological specificity, *Viruses, Genetics, Antigens, Mutations, Diseases.

PB 158 104 $4.60

Stanford Research Inst., Menlo Park, Calif. THE AXON AS A NEURISTOR: AN ANALYSIS OF NERVE TRANSMISSION, by Hewitt D. Crane. Interim rept. 1 on Contract Nonr-3212(00). Nov 60, 45p. 19 refs. SRI Proj. 3286.

DESCRIPTORS: *Nerves, Nervous system, Ions, Electrical properties, Membranes, Sodium, Potassium, *Electric potential, Excitation, Relays, Transmission

Neuristor is the name assigned to the class of devices that exhibits attenuationless signal propagation, as in the attenuationless propagation of a burning zone along a simple chemical fuse, or the attenuationless propagation of an electrical discharge along the axon of a nerve fiber. Early studies have shown that totally distributed electronic lines can be realized that exhibit similar propagation properties; furthermore, many different types of lines can be realized, each characterized by different forms of mathematical systems. This report reviews an analysis of nerve transmission from which excellent electrical models and equation forms are derived. A result of the study has been the realization that the propagation along the axon of a nerve fiber, and that along a (conceptually) rechargeable fuse appear to be fundamentally different, although their terminal properties are identical. Lines realized according to the former style are referred to as N (for nerve) type lines, and those realized according to the latter style as F (for fuse) type lines. The difference between the two forms of line is made clear by example; relay lines built according to both forms, i.e. N-type and F-type, are indicated. (Author)

Radiobiology

TID-6630 $1.00

Hawaii Marine Lab., U. of Hawaii, Honolulu. UPTAKE OF RADIOISOTOPES AND THEIR TRANSFER THROUGH FOOD CHAINS BY MARINE ORGANISMS, by Sidney J. Townsley, Della F. Reid, and Winifred T. Ego. Annual rept. 1959-1960, on Contract AT(04-3)-56. Sep 61, 42p.

PB 158 024 $13.50

Moore School of Electrical Engineering, U. of Pennsylvania, Philadelphia.
DETERMINATION OF BIOLOGICAL IMPEDANCES, by Herman P. Schwan. Vol. V of Physical Techniques in Biological Research. Rept. on PHS grant H-1253 and Contract [Nonr-551(05)]. [1960] 194p. 55 refs. AD-246 604.

DESCRIPTORS: *Impedance, Electrical properties, *Tissues (Biology), Cells (Biology), Electrocardiography, Electric potential, Heart, Diathermy, Microwaves, Alternating current, Radio waves, Biophysics.

A summary is given of principles and techniques which concern the measurement of electrical impedances of biological materials. The investigation of time dependent electrical phenomena (relaxation processes) in biological material was of particular basic interest. It was believed that alternating steady state techniques provide the only practical approach of high resolution to study dynamic, i.e., time dependent biological phenomena. Knowledge of the electrical impedance of biological tissues was of importance in the following areas: (1) theoretical electrocardiography is in good part concerned with attempts to understand the electric potentials due to the hearts activity and as observed on the body surface in terms of simple equivalent generators; (2) ultrashort-wave diathermy; and (3) effects of microwaves on mankind. The article concentrates on alternating current steady state techniques, i.e. investigations which are carried out with alternating currents which have reached their steady state values. (Author)

TID-13358 $2.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
OFFSITE ECOLOGICAL RESEARCH OF THE DIVISION OF BIOLOGY AND MEDICINE - TERRESTRIAL AND FRESHWATER. June 61, 144p.

CHEMISTRY

UCRL-9844 $1.50

Lawrence Radiation Lab., U. of California, Berkeley.
LONGITUDINAL DISPERSION IN PACKED GAS-ABSORPTION COLUMNS, by Tracy T. Word. Rept. on Contract W-7405-eng-48. Sep 61, 61p.

UCRL-9694 $1.00

Lawrence Radiation Lab., U. of California, Berkeley
TABLE OF VIBRATIONAL FORCE CONSTANTS, by Dudley R. Herschbach and Victor W. Laurie. Rept. on Contract W-7405-eng-48. July 61, 46p.

Analytical Chemistry

TEES-2671-1 $2.25

Activation Analysis Research Lab., Texas Engineering Experiment Station, College Station.
COMPUTER COUPLED AUTOMATIC ACTIVATION ANALYSIS, by Lloyd E. Fite, Derek Gibbons, and Richard E. Wainerdi. Annual rept. on Contract AT(40-1)-2671. May 61, 107p.

MCW-1465 $1.25

Mallinckrodt Chemical Works, Weldon Spring, Mo.
PROCESS DEVELOPMENT. Quarterly progress rept. Apr-June 61, on Contract W-14-108-eng-8. Aug 61, 55p.

ORNL-3141 $2.25

Oak Ridge National Lab., Tenn.
DETERMINATIONS OF THE KINETICS AND MECHANISMS OF DEBORONIZATION AT 1135°C, by J. H. Cherubini. Rept. on Contract W-7405-eng-26. [1961] 103p.

DP-618 $0.50

Savannah River Lab., Aiken, S. C.
A RECORDING POLAROGRAPH FOR ROUTINE ANALYSES, by Robert C. Propst. Rept. on Contract AT(07-2)-1. Aug 61, 12p.

DP-627 $0.50

Savannah River Lab., Aiken, S. C.
SPECTROCHEMICAL ANALYSIS IN A LITHIUM CARBONATE MATRIX, by Douglas H. Purcell and J. Allen Wheat. Rept. on Contract AT(07-2)-1. Sep 61, 12p.

Organic Chemistry

GAND-798 $1.60

General Atomic Div., General Dynamics Corp., San Diego, Calif.
THE FORMATION AND PROPERTIES OF PYROLYTIC CARBON, by G. L. Allen, Rept. on Contract AT(04-3)-314. May 59, 11p.

UCRL-9772 $2.50

Lawrence Radiation Lab., U. of California, Berkeley.
BIO-ORGANIC CHEMISTRY QUARTERLY REPORT. Rept. for Mar-May 61, on Contract W-7405-eng-48. June 61, 120p.

Physical Chemistry

NAA-SR-4244(Del.) $1.60

Atomics International, Canoga Park, Calif.
PROPERTIES OF ZIRCONIUM HYDRIDE AND ZIRCONIUM-URANIUM ALLOY HYDRIDES, by S. M. Toy and J. B. Vetrano. Rept. on Contract AT(11-1)-GEN-8. Feb 60, 17p.

NAA-SR-1399(Del.) $11.00

Atomics International, Canoga Park, Calif.
ZIRCONIUM HYDRIDE. PART I. DISSOCIATION PRESSURE. PART II. RADIATION STABILITY, by Paul T. Gilbert, Jr. and Walter V. Goeddel. Rept. on Contract AT(11-1)-GEN-8. 15 Apr 56, 175p.

PB 158 778 $6.60

Clark U., Worcester, Mass.
THE POTENTIAL OF NICKEL IN ELECTROLYTE SOLUTIONS IN THE PRESENCE OF AIR, by Donald MacGillavry, Jr. and Richard W. Swenson. Technical rept. no. 3 on Metal-Solution Potentials of Foreign Ion Half Cells, Contract N7onr-464(01). 31 July 50, 62p. 21 refs. ATI-86 044.

DESCRIPTORS: Metals, *Nickel, *Nickel electrodes, Corrosion, Physical properties, Ions, Adsorption, *Electrolytes, Solutions, Sodium compounds, Hydroxides, Potassium compounds, Carbonates, Sulfates, Hydrochloric acid, Butanol, Water, Nickel compounds, Sulfates, Air, Electrodes.

An investigation of potential-time curves of inert metals in foreign-ion electrolyte solutions was extended to deal with the behavior of nickel in contact with a number of alkaline and acid solutions in the presence of air. Measurements were made with a vacuum tube electrometer of capacitive coupling. It was found that the potentials of nickel in contact with alkaline varied regularly with time (became more positive). The usual potential-time curve shift toward the positive (on dilution) is an indication that the negative ions are adsorbed by nickel in alkaline solutions. Corrosion data seem to show that drifting potentials in aerated solutions depend on surface phenomena, wherein oxygen may play a part. When n-butanol was added to nickel sulfate solutions it appeared that the adsorption of butyl alcohol competes with the adsorption of the anions.

PB 158 814 $1.60

Duke U., Durham, N. C.
THE CHANGE IN OPEN CIRCUIT POTENTIAL OF THE MANGANESE DIOXIDE ELECTRODE ON DISCHARGE AND THE DISCHARGE MECHANISM, by W. C. Vosburgh and James H. DeLap. Technical rept. Oct 57-July 59, on The Discharge Mechanism of the Manganese Dioxide and Other Oxide Electrodes, Contract DA 36-034-ORD-2560. [1959] 18p. 14 refs. OOR rept. no. 1910:2; AD-228 606.

DESCRIPTORS: *Manganese compounds, *Dioxides, Electrodeposition, Electrodes, *Electrochemistry, *Electric potential

The open circuit potential of MgO_2 was studied. Electrodes were prepared by electrodepositing MnO_2 on graphite rods and immersed in an electrolyte of 1 M $(NH_4)_2SO_4$ buffered at $_pH$ 8 by NH_3. Potential measurements were made while the electrode was in the bottle. The final attained potential was taken as the initial potential of the discharge curve. The potentials of electrodes standing in electrolyte decreased more or less rapidly for a few days and then attained a steady rate of decrease of about 0.1 mv/day for all electrodes. Tests showed that one electrode could be transferred from one bottle of electrolyte to another of the same electrolyte with no appreciable change in potential. No Mn^{++} was found in the electrolytes in which the electrodes were stored for recovery during the first 100 ma-min of discharge. During the next interval, an average of 0.12 mg/20 ma-min of discharge was obtained. The straight lines for γ - MnO_2 at $_pH$ 8 indicated that over a certain portion of the discharge, the electrode potential decreased linearly as the formation of the lower oxide increased.

UCRL-6536 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
THE HOMOGENEOUS DECOMPOSITION OF HYDROGEN PEROXIDE BY PLUTONIUM (IV), by Robert E. Elson. Rept. on Contract W-7405-eng-48. Sep 61, 10p.

ORNL-3177 $0.75

Oak Ridge National Lab., Tenn.
SORPTION OF URANIUM ON ZIRCONIUM OXIDE, by Gerald Goldstein. Rept. on Contract W-7405-eng-26. [1961] 26p.

PB 156 184 $2.60

Plastics Lab., Princeton U., N. J.
CONTINUOUS SEPARATIONS OF SUSPENSIONS BY NONUNIFORM ELECTRIC FIELDS IN LIQUID DIELECTRICS, by H. A. Pohl and C. E. Plymale. Contract rept. 2b on Contract DA 36-039-sc-78105. 25 Mar 59, 24p. 6 refs. Technical rept. 53B

DESCRIPTORS: Particles, *Solids, Powders, *Vinyl chlorides, *Chlorides, *Electrophoresis, Separation, *Dielectrics, Liquids, *Electric fields, Electrodes, Polarization, Silicon compounds, Carbides, Dioxides, Aluminum compounds, Oxides, Fluorspar, Zirconium compounds, Silicates, Titanium compounds, Oxides, Separation.

Suspensions of various solids in organic dielectric liquids can be continuously separated into their components by pulsating direct or alternating current electric fields of modest strength. The method and its important variables are described, together with the results observed for several systems. It is found, for example that there exists a critical lower voltage and a critical upper voltage between which operation must take place if appreciable separation is to take place.

PB 156 185 $1.10

Plastics Lab., Princeton U., N. J.
INTRAMOLECULAR HYDROGEN BONDING INVOLVING DOUBLE BONDS, TRIPLE BONDS AND CYCLOPROPANE RINGS AS PROTON ACCEPTORS, by P. R. Schleyer, D. S. Trifan, and R. Bacskai. Contract rept. 2c on Contracts DA 36-039-sc-78105 and DA 36-039-sc-70154. 5 Apr 59, 8p. 11 refs. Technical rept. 53C.

DESCRIPTORS: *Hydrogen, *Chemical bonds, Propenes, Molecular association, Protons, Isomers, Alcohols, Carbon.

Analogous to recent observations of intramolecular hydrogen bonding between proton donors and aromatic rings, the occurrence of intramolecular hydrogen bonding involving unsaturated linkages as proton acceptors has also been observed. Unsaturated linkages investigated include the carbon-carbon double bond, triple bond and cyclopropane ring. Bond strength comparisons, geometric factors and scope of applicability of this phenomenon to structure and stereochemistry elucidation are illustrated. (Author)

PB 156 183 $1.60

Plastics Lab., Princeton U., N. J.
PARTICLE SEPARATIONS BY NONUNIFORM ELECTRIC FIELDS IN LIQUID DIELECTRICS, BATCH METHODS, by H. A. Pohl and J. P. Schwar. Contract rept. 2a on Contracts DA 36-039-sc-78105 and DA 36-039-sc-70154. 20 Mar 59, 12p. 3 refs. Technical rept. 53A.

DESCRIPTORS: Particles, *Solids, Powders, *Vinyl chlorides, *Aluminum compounds, *Chlorides, *Sulfur, Separation, Precipitation, *Electrophoresis, *Dielectrics, Liquids, *Electric fields, Electrodes, Polarization, Moisture.

The motion of suspended solids in nonuniform electric fields in liquid dielectrics is called dielectrophoresis. Some of the quantitative aspects of dielectrophoretic behavior of solids is reported herein. The yield of precipitated solids is seen to rise with applied voltage in cells of cylindrical geometry, until a critical or 'sluff-off' voltage is reached. Current flow during the process was observed to range up to about 20 micromicroamperes, and to indicate that a new method of conduction takes place with the particles present.

PB 155 688 $5.60

Plastics Lab., Princeton U., N. J.
SOLUBILITY OF IRON SULFIDES, by Herbert A. Pohl. Rept. on Contract DA 36-039-sc-78105. 1 Apr 61, 54p. 32 refs. Technical rept. 61C; AD-254 276.

DESCRIPTORS: *Iron compounds, *Sulfides, *Heavy water, Solutions, Solubility, Water, Temperature, Thermodynamics, Stainless steel, Laboratory equipment, Towers (Chemistry), Precipitation, Production, Dissociation, Hydrogen compounds, Mathematical analysis, Ionization, Coatings, Steel.

The thermodynamic data relating to the solubility of various iron sulfides have been collated and extended from 0 to about 230 C. The effects of added H_2S, of acid, or of base are included. The solubility of iron sulfides generally decreases with rising temperature. In equipment made principally of ferrous metals in which water, H_2S, and small amounts of other materials are present under pressure at changing temperatures, massive transport of iron occurs. This causes depositions of iron sulfides. In the presence of H_2S saturated water and aqueous flow through temperature gradients, iron is transported and laid down as various sulfides. Application of these findings to the dual temperature process for heavy water is described. (Author)

PB 156 186 $1.60

Plastics Lab., Princeton U., N. J.
STEREOSPECIFICITY AND ELECTRIC POLARIZATION IN HIGH POLYMERS, by R. Bacskai and H. A. Pohl. Rept. on Contract DA 36-039-sc-78105. 1 Oct 59, 11p. 22 refs. Technical rept. 55A; AD-228 260.

DESCRIPTORS: *Polymers, *Stereochemistry, Molecular structure, Polarization, Chemical properties.

The electric polarization of a polymer is shown to depend upon the steric order along the chain. This is in accord with the previously observed electric polarization behavior of diastereomers. Solution measurements of the molar polarization of polymethylmethacrylates in benzene gave values of 32 ± 0.5 cc/mol. for syndiotactic, and 41 ± 0.5 cc/mol. for isotactic material, with atactic polymer showing intermediate values. It is believed therefore that the polarizability method can form a means of differentiating and interpreting the behavior of polar stereospecific polymers. (Author)

PB 155 686 $3.60

Plastics Lab., Princeton U., N. J.
THERMAL FEEDBACK IN COUNTER-CURRENT PROCESSES. I, by Herbert A. Pohl. Rept. on Contract DA 36-039-sc-78105. 1 Apr 61, 33p. Technical rept. 61A; AD-254 274.

DESCRIPTORS: *Deuterated compounds, Gases, *Heavy water, *Thermodynamics, Hydrogen, *Thermochemistry, Mathematical analysis, Isotopes, Deuterium, Heat transfer, Liquids, Production, Exchange reactions, Sulfides, Hydrogen compounds, Towers (Chemistry), Heat of reaction, Water.

A significant variation of temperature may occur in processes involving counter-current mass transfer when only small amounts of heat are generated within the equipment. A quantitative theoretical treatment of the causes is given here, and the results compared with practice. In the particular case of interest, the dual temperature isotope exchange process using counter-current H_2O and H_2S to obtain water enriched in HDO, the presence of unexpected temperature drops of about 5 to 7 C occurred in the first stage cold towers. Since there is an ice-like hydrate of H_2S that forms at about 28 C at the desired operating pressure, any variation in tower temperature is important. The principal cause of the temperature drop was found to be the above-mentioned temperature magnification of small cooling effects, due principally to the uniform but non-ideal expansion of H_2S. (Author)

PB 155 687 $2.60

Plastics Lab., Princeton U., N. J.
THERMAL FEEDBACK IN COUNTER-CURRENT PROCESSES. II, by Herbert A. Pohl. Rept. on Contract DA 36-039-sc-78105. 1 Apr 61, 22p. Technical rept. 61B; AD-254 275.

DESCRIPTORS: *Heavy water, Hydrogen, Hydrogen compounds, Isotopes, Deuterium, *Deuterated compounds, Heat of reaction, Heat transfer, *Thermodynamics, *Thermochemistry, Exchange reactions, Towers (Chemistry), Production, Gases, Liquids, Sulfides, Mathematical analysis, Water.

The origin of the temperature peaks which occur in counter-current processes is discussed. The cause of temperature rises many times greater than might be expected from the small amounts of heat generated within the equipment is treated quantitatively and compared with observed data. In the particular case of interest, the dual temperature isotope exchange process using counter-current H_2O and H_2S to obtain water enriched in HDO, the presence of unexpected temperature peaks of about 8 to 10 C in the second stage towers adversely affected operation. The cause of the temperature peaks is thermal feedback in the counter-current process, the source of internal heat being the small heat of reaction for the isotope exchange. (Author) (See also PB 155 686)

PB 158 815 $2.60

Theoretical Chemistry Lab., U. of Wisconsin, Madison.
MATHEMATICAL BOTTLENECKS IN THEORETICAL CHEMISTRY, by Joseph O. Hirschfelder. Rept. on Contract DA 11-022-ORD-2526. 26 Oct 59, 21p. 2 refs. WIS-OOR-25; AD-227 618.

DESCRIPTORS: *Physical chemistry, Molecules, Gases, Chemical reactions, Numerical methods and procedures, Theory.

The 3 principal mathematical bottlenecks in the development of theoretical chemistry are discussed. These are: (1) inability to obtain satisfactory approximate solutions to the Schrodinger equation for molecular systems, (2) inability to generalize the Boltzmann equation to give the set of distribution functions for dense gases in which molecules possess internal degrees of freedom and (3) our inability to formulate the rate of chemical reactions in a form suitable for obtaining practical solutions. When these 3 bottlenecks are broken large scale high speed computing efforts will become a practical means for solving many chemical problems. (Author)

PB 158 770 $6.60

University of Southern California, Los Angeles.
NEW METHOD OF DETERMINING DIFFUSION COEFFICIENTS, by Karol J. Mysels and Dirk Stigter. Technical rept. no. 1 on Study of the Properties of Micelles, Contract Nonr-274(00). June 52, 63p. 11 refs. ATI-166 465.

DESCRIPTORS: *Colloids, *Soaps, *Detergents, Diffusion, Measurement, *Diffusion theory, Transport properties, Labeled substances, Radioactive isotopes, *Dyes, Colorimetric analysis.

The primary purpose of this contract is to study micelles of association colloids, particularly of soaps and detergents. The novel approach of using certain dyes which are isoluble in water but are solubilized in the micelle to "tag" the micelles as proposed by Hoyer and Mysels is to be used. Since such solubilized dye may move only by "riding" in a micelle, the movement of the dye gives the movement of the micelle in electrophoresis, diffusion, centrifugation, etc. The primary values to be determined are the electrophoretic mobility and the self-diffusion coefficient of micelles from which their sizes and charges may be estimated. The present report describes a new method of measuring diffusion and a few related topics. The new diffusion method is very simple, accurate, and has a precision of about 0.5%, or five times the analytical error, whichever is greater.

EARTH SCIENCES

WT-1702 $2.25

Stanford Research Inst., Menlo Park, Calif.
EARTH MOTION MEASUREMENTS, by L. M. Swift, D. C. Sachs, and W. M. Wells. Operation Hardtack, Phase II. Jan 61, 108p.

PB 156 997 $4.60

United Research, Inc., Cambridge, Mass.
TURBULENCE MEASUREMENTS AT HIGH ALTITUDES BY SECOND-DIFFERENCE INTERFEROMETRY. AN EXPERIMENTAL SYSTEM, by Dwight W. Batteau and Thomas E. Beling. Quarterly rept. no. 2, 1 Oct-31 Dec 60, on Contract DA 36-039-sc-84963. [1960] 41p. 3 refs. AD-254 808.

DESCRIPTORS: Turbulence, Measurement, High altitude, *Atmosphere, Stratosphere, Radar targets, *Radar tracking, Radio interferometers, Digital computers.

Review is made of the evolution of second difference interferometry as a method of measuring relative positions and velocities of airborne particles. Quadratic approximation to rigorous equation is shown by error analysis to be adequate. The experimental radar installation is described in detail.

Climatology and Meteorology

PB 156 656 $3.60

Chicago U., Ill.
MESOMETEOROLOGICAL STUDY OF SELECTED AREAS IN THE UNITED STATES, by Henry A. Brown and Joseph L. Goldman. Quarterly technical rept. no. 7, 1 Nov 60-31 Jan 61, on Contract DA 36-039-sc-78901. [1961] 35p. 4 refs. AD-254 243.

DESCRIPTORS: *Weather forecasting, Wind, *Atmosphere, Motion, Meteorological data, Weather stations, *Air mass analysis, Arizona.

A mesoscale meteorological network was operated in conjunction with an existing microscale network in southeastern Arizona from December 19-27, 1960. Maps of the area showing the terrain and location of instruments are presented. The operation of the mesoscale network is explained and the reduced data for one day of operation is presented. Included in this data are seven radiosondes taken at one-hour intervals. (Author)

PB 155 742 $5.60

Electrical Engineering Research Lab., U. of Texas, Austin.
RESEARCH IN TROPICAL METEOROLOGY, by Wilfried H. Portig, V. C. Kowalik, and John R. Gerhardt. Quarterly technical rept. no. 2, 1 Oct-31 Dec 60, on Contract DA 36-039-sc-84937. [1961] 55p. 3 refs. AD-251 701.

DESCRIPTORS: *Tropical regions, *Meteorology, Caribbean Sea, Scientific research.

A preliminary survey was made on the results of current tropical area analyses. Particular emphasis was given to tropical thunderstorms, northers, cloud patterns, special wind circulations, weather anomalies and singularities, and instability lines. Differences between tropical and mid-latitude conditions are specifically enumerated. General forecasting techniques and some of the difficulties hampering research progress are outlined. (Author)

PB 156 545 $1.60

Illinois State Water Survey, Urbana.
STUDY ON INTENSITY OF SURFACE PRECIPITATION USING RADAR INSTRUMENTATION, by E. A. Mueller and G. E. Stout. Quarterly technical rept. no. 11, 1 Oct-31 Dec 60, on Contract DA 36-039-sc-75055. [1961] 12p. AD-253 620.

DESCRIPTORS: *Raindrops, *Cameras, Intensity, Measurement, *Meteorological radar, Radioactive fallout, Precipitation

The installation of raindrop cameras at the two new locations of Island Beach, New Jersey and Coweeta Hydrologic Laboratory, Franklin, North Carolina is discussed. These cameras were installed in October and November of 1960. The Indonesia installation is operating satisfactorily and the rate of collection has increased. Data reduction is proceeding normally with more film measured during 1960 than was exposed. (Author) (See also PB 153 651)

PB 155 371 $1.10

Laboratory of Climatology, Centerton, N. J.
MEASUREMENT OF VERTICAL WINDS IN TYPICAL TERRAIN, by C. W. Thornthwaite and W. J. Superior. Quarterly progress rept. no. 2, 1 Oct-31 Dec 60, on Contract DA 36-039-sc-84940. Jan 61, 8p. AD-249 954.

DESCRIPTORS: *Wind, Vertical indicators, Measurement, *Vertical gust recorders, Terrain, Instrumentation, Mobile, Velocity.

Measurement of the vertical winds over different typical terrains is continuing. The principal emphasis continued to be on the construction of the necessary vertical wind measuring instruments, and the instrument masts, and the design of the recording system. A preliminary set of field observations showed that the instruments are working satisfactorily. The observations showed a strong influence of topography and other local environmental factors on the strength and persistence of the vertical wind. Results led to a further consideration of the problem of obtaining observations over different typical terrains. (Author)

PB 156 217 $5.60

New York U. Coll. of Engineering, N. Y.
OBSERVATION AND THEORY OF LOCAL WIND SYSTEMS, by Ben Davidson and Samuel Jaffe. Final rept. 1 Jan 59-30 Sep 60, on Local Wind Systems, Contract DA 36-038-sc-78127. [1960] 60p. 10 refs. AD-253 859.

DESCRIPTORS: *Wind, Meteorology, Analysis, Stability.

The development, dissipation and turbulent content of the valley-plain profile is illustrated. Some examples of unstable profiles are shown. The effect of the prevailing wind on the valley wind regime at anemometer level is studied. Simultaneous observation in a north-south and east-west valley confirms both up and down valley modal flow for both valleys. The daytime flow is considerably more sensitive to the prevailing wind speed than is the nighttime flow. (Author)

ENGINEERING

ANL-6422 $0.50

Argonne National Lab., Ill.
ON TWO-DIMENSIONAL FLUID MOTION THROUGH A SPOUT COMPOSED OF FOUR PLANE WALLS, by Gordon C. K. Yeh. Rept. on Contract W-31-109-eng-38. Oct 60, 15p.

ANL-5760 $1.00

Argonne National Lab., Ill.
TWO-PHASE PRESSURE DROP IN A NATURAL-CIRCULATION BOILING CHANNEL, by B. M. Hoglund, R. J. Weatherhead, and T. R. Epperson. Rept. on Contract W-31-109-eng-38. Aug 61, 42p.

PB 158 846 $1.10

Material Lab., New York Naval Shipyard, Brooklyn, N. Y.
REPORT OF INVESTIGATION OF POLYESTER-GLASS AS PROPELLER SHAFT COUPLING INSULATION FOR REDUCTION OF ELECTROLYTIC CORROSION, by A. Rufolo and R. R. Winans. Progress rept. 7 on Lab. Proj. 5436. 26 Jan 54, 7p. 5 refs.

DESCRIPTORS: *Marine propellers, *Shaft couplings, Couplings, Corrosion inhibition, Corrosion, Electrolytes, *Laminated glass, *Insulating materials, Tests

The elimination of hull and propeller shaft corrosion due to galvanic action was approached from two angles. One was by the application of protective coatings to exposed parts; the other by interruption of the electrical circuit produced by the bimetallic cell. This report is concerned with the latter. Means were considered for interrupting the metallic connection between the bronze propeller and the steel hull so as to eliminate current flow produced by the bronze-iron-seawater battery. In most ships this insulation may be introduced at the first inboard coupling by placing an insulating gasket between the two flange faces, sleeve insulation on the flange bolts and insulating washers

under the nut and head of the bolts. The use of a polyester-glass laminated as the material for assembling this insulating flange coupling is reported. Strength and durability of the polyester-glass was investigated by static tests and by dynamic fatigue tests. Results indicated that this material would be satisfactory and investigation of the material in a service application is recommended. (Author)

PB 157 964 $22.25

Naval Civil Engineering Lab., Port Hueneme, Calif.
EXPERIMENTAL ARCTIC OPERATION HARD TOP I-1953, by Earl H. Moser, Jr. 1 Jan 54, declassified 5 May 61. 435p. 43 refs. Technical rept. R-006; AD-55 160.

DESCRIPTORS: *Runways, Construction, Arctic regions, *Snow, Processing, *Logistics, Housing, Structures, Food, Heat, Electricity, Water, *Snow roads, Trafficability, Road building equipment.

HARD TOP I had as its mission (1) the evaluation of the logistical and operational requirements of a small independent airborne functional component constructing a snow compacted runway in an undeveloped Arctic region, and (2) the evaluation by use of heavy wheeled aircraft of a snow runway constructed on deep snow with the pulvimixer-roller compaction process. Procedures, problems, and results are discussed in detail and recommendations are given. (Author)

SCTM-316A-60(73) $0.50

Sandia Corp., Albuquerque, N. Mex.
A THEORETICAL INVESTIGATION OF THE CONTROL PARAMETERS REQUIRED TO SHAPE THE SPIKE PHASE PULSE IN TWO-PHASE SHOCK TESTS by R. I. Butler. Sep 61, 15p. (This SCTM will supersede SCTM-316-60(73) issued Feb 61).

K-1487 $0.50

Union Carbide Nuclear Co., Oak Ridge, Tenn.
BOILING OF FREON-114 IN A THREE-FOOT STRAIGHT TUBE EVAPORATOR, by Charles F. Allen. Rept. on Contract W-7405-eng-26. Oct 61, 22p.

Aeronautical Engineering

PB 158 747-1 $14.50

Eclipse-Pioneer Div., Bendix Aviation Corp. [Teterboro, N. J.]
RESEARCH AND DEVELOPMENT OF A HOT GAS FLIGHT STABILIZATION SYSTEM. Rept. on Contract AF 33(600)40538. Sep 60, 216p. 140 refs. WADD Technical rept. 60-449, Part I, Volume I; AD-245 207.

DESCRIPTORS: Airframes, Spaceships, *Control systems, Stabilization, Gas flow, Satellite vehicles, Re-entry vehicle, Design, *Gas generating systems, Liquid rocket propellants, Flight, Greases, Propellants

This volume describes the preliminary requirements for a Hot Gas Flight Stabilization System applicable to a broad range of advanced vehicles. It delineates the development approach used and the results obtained in following this approach. The preliminary system derived through the use of root locus analysis of the vehicle dynamic stabilization requirements and a histogram analysis of critical vehicle parameters is based upon data accumulated in a comprehensive survey of present and future vehicles. The report further establishes the state-of-the-art in applicable component technology and, through a preliminary evaluation of survey information, provides conclusions regarding equipment modification and developments. The preliminary system described in the report will, through proper scaling of components, meet the exact stabilization requirements of most of the individual vehicles used in the analysis.

PB 156 213 $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
THERMAL STRESS ANALYSIS BY ENERGY METHODS, by Louis A. Riedinger. June 58, 30p. LSMSD-3123-R1.

DESCRIPTORS: *Aircraft, *Structures, *Thermal stresses, Stresses, Mathematical analysis, Thermal expansion, Elasticity, Energy, Temperature, Lod distribution, Materials.

An energy analysis is used to obtain thermal stresses in a structure subjected to temperature variation. After structural idealization--the application of redundants between the specified adjacent structural elements--the temperature of each element is applied. With the redundants missing, each element freely expands; however, the confinements generating thermal stress are calculated by use of Castigliano's minimal energy theorem and with the aid of a digital computer. Temperature stresses due to dissimilar materials are also calculated by this method. Various materials are combined in an attempt to reduce the thermal stress. In particular the $\alpha\Delta T$ product of the various members is studied. (Author)

PB 155 132 $3.60

National Research Labs., Ottawa (Canada).
SEA TRIALS OF THE TUMBLING AEROFOIL CRASH POSITION INDICATOR, by H. T. Stevinson, D. A. Baker and others. Dec 60, 32p. Aeronautical rept. LR-292; N.R.C. no. 6121; AD-252 385.

DESCRIPTORS: *Radio beacons, Tests, *Radio rescue buoys, Aircraft, Aviation accidents, *Air sea rescue beacons, Sea rescue equipment.

To evaluate the seaworthiness and range obtainable with the N.R.C. tumbling aerofoil type of crash position indicator beacon in both calm and rough sea conditions, tests were conducted 30 miles off the coast of Halifax, Nova Scotia. An aircraft search height of 9000 feet was used to obtain both polar patterns and extreme range information. A range of 32 miles was obtained during a Beaufort sea state 4 to 5 and a range of 23 miles during sea state 5 to 7 with two different beacons each having a life of about 4 days.

Chemical Engineering

NYO-9578 $1.00

Aeroprojects, Inc., West Chester, Pa.
ULTRASONIC FUEL-REPROCESSING IN MERCURY, by W. B. Tarpley and C. D. McKinney, Jr. Rept. on Contract AT(30-1)-1836. Mar 61, 44p.

AD-256 032 $1.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
ACETYLENE: HIGH PRESSURE SOLUBILITY AND THERMODYNAMIC PROPERTIES, by George E. Owens. Apr 61, 11p. 18 refs. Special Bibliography SB-61-14.

DESCRIPTORS: *Acetylenes; Solubility, Thermodynamic properties, Solvent action, Acetones, Organic solvents, High pressure research, Pressure, High temperature research, Gases, Physical properties, *Bibliography.

Information was desired on the solubility of acetylene in acetone at pressures upward from twelve atmospheres and also at pressures approximating one millimeter of mercury; on the solubility of acetylene in other solvents; and on the thermodynamic properties of acetylene. Data on solubility in acetone were found for pressures from one to thirty atmospheres. No solubility data were found for the low-pressure range. Very little was found relating to solubility in other solvents. The thermodynamic properties of acetylene have received more attention in the literature. Data were found for pressures from 14.69 to 2,000 pounds per square inch absolute and for temperatures from 32 to 500 degrees Fahrenheit. (Author)

ORNL-3153 $2.75

Oak Ridge National Lab., Tenn.
CHEMICAL TECHNOLOGY DIVISION. Annual progress rept. for period ending 31 May 61, on Contract W-7405-eng-26. [1961] 163p.

IDO-14410(Del.) $8.60

Phillips Petroleum Co., Idaho Falls.
IDAHO CHEMICAL PROCESSING PLANT, by C. E. Stevenson. Technical progress rept. Jan-Mar 57, on Contract AT(10-1)-205. July 57, 94p.

Electrical and Electronic Engineering

PB 156 220 $4.60

AC Spark Plug Div., General Motors Corp., Milwaukee, Wis.
LOW-NOISE SUPERHETERODYNE RADIOMETER INVESTIGATION, by C. G. Spacek and R. F. Brewster. Final rept. 16 July-25 Sep 59, on Contract DA 36-039-sc-78353. 10 Aug 60, 48p. 3 refs. AD-247 344.

DESCRIPTORS: *Radiometers, Microwaves, Signal-to-noise ratio, Crystal mixers, Electronic circuits, Circuits.

An experimental and theoretical investigation to determine the feasibility of using multiple local oscillators to improve the signal-to-noise ratio in a superheterodyne radiometric receiver is reported. The use of multiple local oscillators is an extension of conventional superheterodyne radiometer design which detects power from both lower and upper RF sidebands. A radiometer with multiple local oscillators heterodynes several RF bands to a common intermediate frequency. The input signal is proportional to the number of local oscillators used while the receiver noise is the same as that of a conventional, single-local-oscillator radiometer, therefore, a better output signal-to-noise ratio should result. However, the conversion efficiency of a mixer with multiple local oscillators decreases approximately in the same ratio as the number of local oscillators used and thus, little, if any, improvement of signal-to-noise ratio is actually attainable. Considerations leading to the assumption that the multiple-local-oscillator radiometer has a better output signal-to-noise ratio than the conventional superheterodyne radiometer are described, the conversion efficiency of a multiple-local-oscillator receiver is analyzed, and the results of experiments made at microwave and audio frequencies are reported. (Author)

PB 158 855-1 $2.60

Armour Research Foundation, Chicago, Ill.
PRINTED-WIRING SOLDERED ELECTRICAL CONNECTIONS, by E. H. Koeller and H. R. Nelson. Quarterly progress rept. no. 1, 15 July-15 Oct 58, on Contract DA 36-039-sc-78167. [1958] 21p. ARF Proj. K159.

DESCRIPTORS: *Printed circuits, *Electric connectors, Soldering, *Soldered joints, Failure (Mechanics), Joints, Circuits

A background-gathering activity, consisting of a literature study and a survey of the printed wiring industry, was carried out with emphasis on soldered electrical connections, methods of soldering, and solder joint failures. The lack of information concerning solder joint failures is emphasized. Plans are developed for determining the effect of materials and of joint structure on the strength and performance of eight, basic, soldered electrical connections. (Author)

PB 158 855-2 $4.60

Armour Research Foundation, Chicago, Ill.
PRINTED-WIRING SOLDERED ELECTRICAL CONNECTIONS, by E. H. Koeller and H. R. Nelson. Quarterly progress rept. no. 2, 15 Oct 58-15 Jan 59, on Contract DA 36-039-sc-78167. [1959] 49p. 5 refs. ARF Proj. K159.

DESCRIPTORS: *Printed circuits, *Electric connectors, Vibration, Shock resistance, Soldering, *Soldered joints, Tools, Design, Stresses, Mathematical analysis, Circuits, Joints

This report presents a discussion of requirements for and design of experimental printed-wiring boards for producing eight basic types of soldered electrical connections. The choice of necessary accessory parts, designs of special fixtures and tooling, and investigation of material characteristics as related to

the program are covered. In addition, a discussion of the modifications to and initial trials of directional flow-type soldering equipment is given. A mathematical analysis of forces and stresses affecting soldered connections and resulting from vibration as well as shock loadings is presented. (Author)

PB 158 855-3 $6.60

Armour Research Foundation, Chicago, Ill.
PRINTED-WIRING SOLDERED ELECTRICAL CONNECTIONS, by E. H. Koeller and H. R. Nelson. Quarterly progress rept. no. 3, 15 Jan-15 Apr 59, on Contract DA 36-039-sc-78167. [1959] 64p. 1 ref. ARF Proj. K159; AD-220 129.

DESCRIPTORS: *Printed circuits, *Electric connectors, Vibration, Shock resistance, Soldering, *Soldered joints, Materials, Copper wire, Tin, Lead, Mechanical properties, Non-destructive testing, Metallurgy, Design, Joints, Circuits

This report describes the various experiments being performed and planned to determine the material characteristics influencing the strength or reliability of soldered connections in printed wiring. Test results to date are presented and evaluated. Stress determination and the evaluation of joint design criteria are discussed; intended joint modifications are presented. Soldering and related problems are also discussed. In the appendices, the following presentations are made: (1) Mathematical analysis of the forces and stresses acting on straight-through soldered connections under shock and vibration loadings imposed in the axial and transverse directions. (2) Determination of the rate of solution of copper in molten solder and the effect of such solution on printed-wiring soldered connections. (3) Theoretical determination of the maximum capillary rise and the rate of capillary rise of molten solder in a printed-wiring soldered electrical connection. (Author)

AD-257 038 $8.10

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
ASCOP FCT-1 TELEMETRY TRANSMITTER SPECTRUM UTILIZATION, by William E. Castilo, Virgilio Cisneros, and Merwin A. Olson. 20 Apr 61, 82p. AFC rept. no. TM-20-4-61-T.

DESCRIPTORS: *Telemetering transmitters, Radiofrequency spectrum analyzers, Frequency modulation, Frequency analyzers, Frequency meters, *Frequency shift keyers, Radio interference, Radio equipment, Radiofrequency, Guided missiles, Very high frequency, Frequency stabilizers, Tests, Airborne, Stability, Military communications.

Spectrum utilization characteristics of the ASCOP FCT-1 PW/FM Transmitter and associated FKH-1X1 Keyer were empirically examined. Frequency stability was 0.01% or better, except at low temperature extremes ($\leq -32^{o}C$) and certain vibrational conditions. There were five, antenna conducted, and 31, case radiated, spurious emanations which exceeded WSMR Regulation Nr 105-2. (Author)

AD-257 037 $3.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
DORSETT TR-30 TELEMETRY TRANSMITTER SPECTRUM UTILIZATION, by William E. Castilo. 5 May 61, 39p. AFC rept. no. TM-5-5-61-T.

DESCRIPTORS: *Telemetering transmitters, Radiofrequency spectrum analyzers, Frequency modulation, Radio interference, Frequency stabilizers, Radio equipment, Telemeter systems, Harmonic analysis, Very high frequency, Test, Frequency analyzers, Frequency meters, Guided missiles, Airborne.

The spectrum utilization of the FM Transmitter Dorsett Model TR-30 was determined to facilitate the allocation of frequencies. Its frequency stability, output power, modulation sensitivity and spurious emissions were examined empirically. The frequency varied in excess of 0.01%. The 2nd, 3rd, 4th, and 5th harmonics (antenna conducted) exceeded the limits of WSMR Regulation 105-2. Harmonic outputs should be reduced before the unit is authorized for use at WSMR. A clear channel bandwidth of ±250 KCS should be allocated. (Author)

AD-258 521 $4.60

Army Signal Missile Support Agency, White Sands Missile Range, N. Mex.
TELE-DYNAMICS 1004A TELEMETRY TRANSMITTER SPECTRUM UTILIZATION, by Virgilio Cisneros. 5 June 61, 50p. AFC rept. no. TM-5-6-61-T.

DESCRIPTORS: *Telemeter systems, *Telemetering transmitters, Radiofrequency spectrum analyzers, Frequency modulation, *Radio interference, Radio interference analyzers, Frequency stabilizers, Standing wave ratios, Measurements, Tests, Very high frequency

Spectrum utilization characteristics of the Tele-Dynamics Inc. FM Telemetry Transmitter Type 1004A were determined empirically. Frequency stability was within the required ± 0.01% as per WSMR Regulation Nr 105-2 except for prolonged exposure to environmental conditions wherein the case temperature exceeded 38°C. Spurious emissions, antenna conducted, were within WSMR Regulation Nr 105-2. Six spurious emissions, radiated, exceeded the limits of MIL-1-26600. A clear channel bandwidth of ±264 KCS should be allocated for interference free operation. (Author)

PB 156 218 $1.60

Bright Star Industries, Clifton, N. J.
FLAT CELL MAGNESIUM DRY CELL BATTERIES, by F. A. Keller. Semi-annual progress rept. no. 3, 1 Apr-1 Oct 60, on Contract DA 36-039-sc-78231. [1960] 17p. AD-251 012.

DESCRIPTORS: *Dry cells, Magnesium alloys, Storage batteries, Zinc alloys, Electrodes, Magnesium electrodes, Zinc coatings, Zinc electrodes, Electrolytes

A series of experiments were made with a conductive adhesive at various plating times. A zinc coating

electroplated on magnesium electrodes which were then coated with a conductive adhesive reduced the contact resistance of duplex anodes. The zinc plating is sufficiently bonded to magnesium surface to permit the use of conventional lead tin solder alloys. (See also PB 150 804)

PB 181 046 $0.50

Bureau of Naval Weapons, Washington, D. C. AMPLIFIER AND NULL DETECTOR GENERAL RADIO 1231-BMA. BuWeps-BuShips Calibration Program. 2 Oct 58, 12p. Secondary Standards Lab. Instrument Calibration Procedure AA-01 (Supersedes AA-10).

DESCRIPTORS: *Radiofrequency amplifiers, Amplifiers, Radio, *Null indicators, Calibration, Instrumentation, Instruction manuals, Detectors.

The Test Instrument is a high-gain amplifier and null detector with ac-coupled input and output. It has input selectors with impedances of 1 or 10 megohms and attenuations of 0 or 30 db. Push-button switches connect the meter as a null detector or as a linear voltmeter in two ranges. It may be battery or ac operated and switches are provided for checking the power supply.

PB 181 051 $0.50

Bureau of Naval Weapons, Washington, D. C. COUNTER, ELECTRONIC HEWLETT PACKARD 522B. BuWeps-BuShips Calibration Program. 25 June 59, 22p. Secondary Standards Lab. Instrument Calibration Procedure AF-04 (Supersedes AF-17)

DESCRIPTORS: *Electronic counters, Calibration, Instrumentation, Instruction manuals, Crystal oscillators, Oscillators, Circuits, Display systems, Frequency, *Time interval counters.

The Test Instrument is an electronic counter which consists of a crystal oscillator, phantastron dividers, a gating circuit, and a decimal display system. It can be used to measure frequency, period (reciprocal of frequency), or time interval.

PB 181 056 $0.50

Bureau of Naval Weapons, Washington, D. C. DETECTOR MOUNT, G-BAND (3.95 TO 5.85 KMC). BuWeps-BuShips Calibration Program. 31 Mar 60, 16p. Secondary Standards Lab. Instrument Calibration Procedure GD-05.

DESCRIPTORS: *Radiofrequency power, Measurement, Detection, Instrumentation, *Bolometers, G-band, Calibration, Instruction manuals, Power.

The Test Instrument is a device for measuring or detecting RF power. The Test Instrument with a fixed bolometer element is tested by measuring the input VSWR. The bias current is supplied by an external bolometer bridge. Test Instruments with adjustable bolometer mounts are also functionally tested to determine whether they can be adequately tuned through the frequency range.

PB 181 049 $0.50

Bureau of Naval Weapons, Washington, D. C. FREQUENCY METER TS-173/UR. BuWeps-BuShips Calibration Program. 16 Aug 61, 16p. Standards Lab. Instrument Calibration Procedure AF-25.

DESCRIPTORS: *Frequency meters, Meters, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a frequency meter with a frequency range from 90 to 450 megacycles, and a minimum sensitivity of 20 microvolts. It will function properly with line voltage variations from 105 to 125 volts. When used as an RF signal generator, the output voltage is variable from 465 microvolts to 0.1 volt, and can be modulated with a 1000-cps signal.

PB 181 061 $0.50

Bureau of Naval Weapons, Washington, D. C. GENERAL RADIO 1210-C UNIT OSCILLATOR. BuWeps-BuShips Calibration Program. 8 Jan 60, 36p. Secondary Standards Lab. Instrument Calibration Procedure AG-29.

DESCRIPTORS: *Radiofrequency oscillators, Oscillators, Radio, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a compact oscillator that has a frequency range from 20 cps to 500 kc. The output waveform is either sinusoidal or square, and the amplitude is continuously adjustable. An external power supply is required to provide the necessary B+ and filament voltages.

PB 181 062 $0.50

Bureau of Naval Weapons, Washington, D. C. GENERATOR, LOW FREQUENCY FUNCTION, HEWLETT PACKARD 202A. BuWeps-BuShips Calibration Program. 2 July 59, rev. 1 Aug 60, 19p. Secondary Standards Lab. Instrument Calibration Procedure AG-19.

DESCRIPTORS: *Oscillators, Low frequency, *Signal generators, Generators, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is an oscillator for generating sine, square, and triangular wave signals in the range from 0.008 to 1200 cps.

PB 181 048 $0.50

Bureau of Naval Weapons, Washington, D. C. HEWLETT PACKARD 100D LOW FREQUENCY STANDARD. BuWeps-BuShips Calibration Program. 3 Jan 59, 23p. Secondary Standards Lab. Instrument Calibration Procedure AG-12.

DESCRIPTORS: *Low frequency, Frequency, Standards, *Crystal oscillators, Oscillators, Frequency meters, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a secondary frequency standard that provides accurate sine wave signals of 10 cps, 100 cps, 1 kc, 10 kc, and 100 kc; rectangular waves of 10

cps, 100 cps 1 kc, and 10 kc; and marker pips at intervals of 100, 1000, and 10,000 microseconds. It includes a 100 kc crystal oscillator, frequency dividing and wave shaping circuits, and a simple oscilloscope.

PB 181 047 $0.50

Bureau of Naval Weapons, Washington, D. C. KROHN-HITE 440A PUSH-BUTTON OSCILLATOR. BuWeps-BuShips Calibration Program. 30 June 59, 28p. Secondary Standards Lab. Instrument Calibration Procedure AG-18.

DESCRIPTORS: *Oscillators, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a push-button oscillator providing sine and square-wave signals in the range from 0.001 to 100,000 cps.

PB 181 050 $0.50

Bureau of Naval Weapons, Washington, D. C. MEGACYCLE METER MEASUREMENTS CORP. 59, 59LF, 59UHF. BuWeps-BuShips Calibration Program. 5 Apr 60, 27p. Secondary Standards Lab. Instrument Calibration Procedure AF-20.

DESCRIPTORS: Ultra high frequency, Low frequency, Meters, *Frequency meters, Calibration, Instrumentation, Instruction manuals, Frequency.

The signal source is coupled to the Test Instrument coil by means of a short antenna. Frequency coincidence is detected by means of headphones connected to the Test Instrument, whereby the beat note or modulating tone is detected aurally. The frequency of the signal source is then measured by means of the Electronic Counter and appropriate plug-in units up to 210 Mcps, and by using the Transfer Oscillator and Counter for higher frequencies.

PB 181 057 $0.50

Bureau of Naval Weapons, Washington, D. C. MICROWAVE ATTENUATORS, WAVEGUIDE 0 TO 50 DB 2.60 TO 26.50 Gc(KMC). BuWeps-BuShips Calibration Program. 17 Sep 61, 41p. Standards Lab. Instrument Calibration Procedure GA-04 (Supersedes HA-01, HA-03, HA-04, HA-05 and HA-08).

DESCRIPTORS: *Waveguides, *Microwave attenuators, Calibration, Instrumentation, Instruction manuals.

This procedure utilizes the audio substitution method for attenuator calibration, in which audio attenuation is substituted for RF attenuation to maintain a constant audio output with the Test Instrument first removed and then inserted into the microwave line.

PB 181 053 $0.50

Bureau of Naval Weapons, Washington, D. C. MODIFICATION INSTRUCTIONS, HERMACH ENGELHARD - MODEL 30081 TRANSFER VOLT-AMMETER. BuWeps-BuShips Calibration Program. 1 Feb 60; 3p. [Secondary Standards Lab.] TDO M-3.

DESCRIPTORS: Voltage, *Ammeters, Instruction manuals, Meters.

PB 181 054 $0.50

Bureau of Naval Weapons, Washington, D. C. MODIFICATION INSTRUCTIONS, JOHN FLUKE - MODEL 801 VOLTMETER. BuWeps-BuShips Calibration Program. 1 Feb 60, 2p. [Secondary Standards Lab.] TDO M-2.

DESCRIPTORS: *Voltmeters, Instruction manuals, Meters.

PB 181 055 $0.50

Bureau of Naval Weapons, Washington, D. C. MODIFICATION INSTRUCTIONS, SORENSON VRS-AC-751. BuWeps-BuShips Calibration Program. 1 Feb 60, 2p. [Secondary Standards Lab.] TDO M-1.

DESCRIPTORS: *Voltage, Sources, Instruction manuals.

PB 181 058 $0.50

Bureau of Naval Weapons, Washington, D. C. MULTIMETER AN/USM-34. BuWeps-BuShips Calibration Program. 13 Sep 61, 30p. Standards Lab. Instrument Calibration Procedure AQ-16.

DESCRIPTORS: *Multimeters, Calibration, Instrumentation, Instruction manuals, Broadband, Electron tubes, Voltmeters, Meters.

The Test Instrument is a general purpose broad-band VTVM which measures resistance, direct current, direct voltage, alternating voltages between 50 cps and 50 kc, and with an RF probe, voltages from 1 kc to 100 Mc.

PB 181 060 $0.50

Bureau of Naval Weapons, Washington, D. C. OSCILLATOR, AUDIO TS-382A/U THROUGH TS-382F/U. BuWeps-BuShips Calibration Program. 28 Mar 60, 25p. Secondary Standards Lab. Instrument Calibration Procedure AG-35.

DESCRIPTORS: Audiofrequency, *Oscillators, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is an oscillator with a frequency range of from 20 cps to 200 kc. It contains a vibrating reed frequency meter and an output voltmeter. The output voltage is variable from 0 to 10 volts into 1000 ohms.

PB 181 052 $0.50

Bureau of Naval Weapons, Washington, D. C. PREAMPLIFIER, DUAL TRACE, PLUG-IN TEKTRONIX 53/54C. BuWeps-BuShips Calibration Program. 16 Mar 59, rev. 1 June 60, 28p. Secondary Standards Lab. Instrument Calibration Procedure AA-05.

DESCRIPTORS: *Preamplifiers, Amplifiers, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a plug-in dual-trace preamplifier used with Tektronix 530-, 540-, and 550 series oscilloscopes. The two channels are identical and panel

controls in each channel provide ac- or dc-input coupling, calibrated step or continuously variable attenuation, control of gain, vertical positioning, and inversion of polarity. A mode selector connects either channel output to the oscilloscope or provides for electronic switching of the channels triggered by the oscilloscope sweep or at a free running rate.

PB 181 059 $0.50

Bureau of Naval Weapons, Washington, D. C.
UNIT POWER SUPPLY, GENERAL RADIO 1203-A & 1203-B. BuWeps-BuShips Calibration Program. 29 Dec 58, 9p. Secondary Standards Lab. Instrument Calibration Procedure AH-04 (Supersedes ICP 9007, ICP 19007 and AH-08).

DESCRIPTORS: *Radio equipment, *Power supplies, Calibration, Instrumentation, Instruction manuals.

The Test Instrument is a compact nonregulated power supply designed primarily to furnish filament and B+ voltages to General Radio unit instruments.

PB 157 543 $11.50

Centre de Physique Electronique et Corpusculaire (France).
WIDE DYNAMIC RANGE BARRIER GRID STORAGE TUBES WITH LINEAR CHARACTERISTICS T. C. M. 16 AND T. C. M. 17, by G. Wendt. Final rept. Jan 59-July 60, on Contract N62558-2275. 30 Sep 60, 153p. WR 577; AD-245 603.

DESCRIPTORS: *Storage tubes, Electron tubes, France, *Electron guns, Design, Tests

Work done to improve the Barrier Grid Storage Tube TCM 14 is summarized. The development was directed, as a distant target, to obtaining linearity between the output and input signals. The nearer target, in particular the target for the period covered by the present report, was to obtain linearity of writing only, i. e. linearity between the charges deposited on the target and the input signal. This meant developing a gun whose beam current was proportional to the input signal. Two different guns were developed: one with magnetic deflection, whose control grid consisted of a series of parallel wires, and the other with electrostatic deflection, whose beam current was modulated by deflecting the beam on a slot. (Author)

PB 158 033 $1.10

Centre de Physique Electronique et Corpusculaire (France).
WIDE DYNAMIC RANGE BARRIER GRID STORAGE TUBES WITH LINEAR CHARACTERISTICS T. C. M. 16 AND T. C. M. 17. Supplemental final rept. on Contract N62558-2275. 30 Dec 60, 5p. WR 577; AD-248 628.

DESCRIPTORS: *Storage tubes, *Electron guns, Inventions, Electron beams, Modulation, Deflection.

An electron gun with modulation by beam deflection for barrier grid storage tubes was invented to improve linear characteristics of the tube. A conical beam formed by a conventional triode, and whose apex coincides with the cross-over point is used to cut out a pyramid shaped beam, by means of a square diaphragm This beam is then deflected by the modulating voltage applied to a first pair of plates, on a slit whose width is about equal to the width of the beam at that point. The current through that slit will then be a linear function of the modulating voltage. The virtual position of the cross-over which serves as objective for the main lens will then be shifted transversely, and this will bring about a corresponding shift of the spot on the target. In order to return the virtual cross-over to its initial position, thus compensating the displacement of the spot, the beam is deflected in the opposite sense by the same modulating voltage applied to a second pair of plates. (Author)

PB 156 993 $3.60

David Sarnoff Research Center, Princeton, N. J.
GENERATION OF "COOL" ELECTRONS FOR LOW-NOISE MICROWAVE TUBES, by J. Berghammer, S. Bloom and others. Semi-annual rept. no. 3, 1 Aug 59-30 Jan 60, on Contract DA 36-039-sc-78151. 15 Mar 61, 37p. 22 refs. AD-235 876.

DESCRIPTORS: *Electron beams, *Electron tubes, Cathodes (electron tubes), Oxide cathodes, Noise (Radio), Reduction, Microwave equipment, Cooling, Plasma physics

A plasma cathode consisting of an electron emissive oxide cathode on which is laid an ion-emissive β-eucryptite mesh has yielded electron current densities in the order of 20 ma/cm^2, the mesh being at 1150 C and the oxide cathode at 900°C. This high current density is a result of the close proximity of the two types of emitters and is a five- to six-fold increase over the current densities obtained previously with a separated β-eucryptite toroid. A cesiated hollow cathode has yielded a current density of 20 ma/cm2 and an electron temperature of only 480°C. A beam extraction tube has been built for measuring the temperature of electrons before and after extraction from the plasmas. An "SIIF Tube" is being constructed for measurements of basic noise parameters on beams. A new noise smoothing mechanism is proposed which makes use of the evanescence of space charge waves in dense low-velocity electron beams. (Author)
(See also PB 154 523)

PB 158 215 $5.60

David Sarnoff Research Center, Princeton, N. J.
GENERATION OF "COOL" ELECTRONS FOR LOW-NOISE MICROWAVE TUBES, by J. Berghammer, S. Bloom and others. Final rept. 1 July 58-31 July 60, on Contract DA 36-039-sc-78151. 15 Oct 60, 56p. 20 refs. AD-248 721.

DESCRIPTORS: Cesium electron tubes, Cooling, Hydrogen, Lithium, Mathematical analysis, Electron guns, Space charges, Reduction, Low frequency, Noise, Plasma physics, *Electron beams, *Cathodes (Electron tubes), *Traveling wave tubes, *Electron tubes

Plasma cathodes of both the cesium hollow cathode variety and the beta-eucryptite lithium ion variety were studied. The former provides exceptionally high current density beams at usual temperatures and

adequate current densities at exceptionally low temperatures. The latter is the simpler variety of plasma cathode; however, it operates at conventional (1100 degrees C) temperatures. Low-frequency (up to 50 mc) noise probings indicate that neither variety of plasma cathode exhibits the large electron temperatures of discharge-type plasmas. An S(Pi)F Tube for measuring noise parameters was designed and parts fabricated. This tube differs from others of like purpose in its simplicity of external electronics and in assurance of good cathode activity. A correlation between low TWT noise factors and space-charge instability effects of the 6L6 type was found. Theoretical studies of S(x)+Pi(x) indicate the important role of the Maxwellian distribution, and the connection found between entropy flux and ac potential suggests the possibility of a thermodynamic interpretation of S+Pi equals constant. (Author)

PB 158 769 $5.60

Eastman Kodak Co., Rochester, N. Y.
BASIC RESEARCH FOR AMMONIA VAPOR ACTIVATED BATTERIES, by John M. Freund and Robert W. Graham. Quarterly progress rept. no. 1, 1 May-31 July 56, on Contract DA 36-039-sc-72306. [1956]. Declassified 15 Feb 56, 58p. 14 refs. AD-119 827.

DESCRIPTORS: *Primary batteries, Liquids, *Ammonia, *Electrolytes, Solutions, Electrochemistry, Physical chemistry, Vapor pressure, Solubility, Conductivity, Electrodes, Polarization, Freezing, Corrosion.

This report presents information pertinent to the electrochemistry of solutions in liquid ammonia. A historical review is provided as an introduction to the subject, and information previously obtained has been included. The solubility of various substances in ammonia, and vapor pressure, conductivity, and other properties of various solutions are covered in detail.

PB 157 773 $2.60

Electric Storage Battery Co., Yardley, Pa.
INVESTIGATION OF AgO PRIMARY BATTERIES, by P. Ruetschi and R. F. Amlie. Quarterly rept. no. 4, 1 Mar-30 June 60, on Research and Development Work on a Non-Reserve AgO Primary Cell, Contract DA 36-039-sc-78319. 13 Sep 60, 29p. AD-246 968.

DESCRIPTORS: *Primary batteries, *Silver compounds, *Oxides, Electrodes, Tests, *Zinc, Preparation, Electrolytes, Effectiveness, Power supplies, Electrolytic cells, Design, Tests.

Non-reserve primary AgO-Zn cells were assembled employing high capacity electroformed AgO plates. The electrodes were tested in a multi-plate construction of the ESB type S-7.5 size cell. A majority of the multi-plate cells assembled and tested were made with a 6 negative - 5 positive assembly. Cells discharged at the 2 ampere continuous rate normally delivered 15 to 16 ampere hours, which is equivalent to an energy output of 60-64 watt-hrs./lb. at an average 1.5 volt closed circuit potential. Chemical and electroformed AgO materials were also evaluated in a button-type designated 625-DT. A higher cell operating voltage and greater energy output were obtained by the incorporation of a special conductive matrix in the AgO pellet electrode. (Author) (See also PB 149 610)

PB 157 594 $2.60

Electric Storage Battery Co., Raleigh, N. C.
INVESTIGATION OF AgO PRIMARY BATTERIES, by G. M. Wylie. Quarterly progress rept. no. 6, 1 Oct-31 Dec 60, on Research and Development Work on a Non-Reserve AgO Primary Cell. Contract DA 36-039-sc-78319. 27 Jan 61, 29p. Rept. no. E-02-61; AD-254 694.

DESCRIPTORS: *Primary batteries, Hydroxides, Potassium compounds, *Silver compounds, Zinc, Electrodes, Storage, Electrochemistry, Power supplies, Low temperature research, Battery separators, Alkaline cells, *Oxides, Electrolytic cells, Design, Tests.

Non-reserve primary Zn/KOH/AgO cells were assembled and tested in an ESB type 5-15 size cell. New cells were discharged at the 1.5 amp continuous rate (120 ma/sq in.) (7-8 hour rate). The best type of the cells made delivered 11.5 to 11.8 ampere-hours and produced an energy output of 76 to 78 watt-hours per pound to 1.1 volts. Cells, employing a variety of separator systems, were stored at 160 F. for two weeks and then discharged at the 1.5 ampere continuous rate. The capacity retention for the positive electrode was 77 tp 79% and for the negative electrode was 81 to 83%. Cells discharged at -35 F. at the 110-hour rate delivered about 29% of their room temperature capacity. (Author) (See also PB 157 773)

PB 158 767 $14.00

[General Dynamics/Electronics] Rochester, N. Y.
FAULT LOCATION STUDY, by W. H. Wobig and L. E. Tryon. Technical rept. on Contract AF 30(602)1996. Dec 59, 208p. 1 ref. RADC-TR-59-250; AD-235 337.

DESCRIPTORS: *Electronic equipment, Reliability, Test equipment, Design, Automatic; Data processing systems, Tests, Digital systems, *Radar equipment, *Antiaircraft defense systems, Quality control, Test methods, Analog systems; Radar stations.

Work is described on a study program leading to definitive design recommendations for the basis system components of an Automatic Fault Locator, applicable to complexes at SAGE Radar Sites and other ground electronic systems. Overall system performance quality is automatically monitored periodically by means of a series of measurements which constitute a major routine and serve as criteria for judgement of quality. Failure, of any one of the several measurements to meet limits, automatically initiates fault isolation sub-routines which localize the cause of the system performance impairment to a major system module or modules (i. e., IF amplifier, modulator, oscillator, phase detector, or binary counter). Automatic monitoring and, in many cases, fault isolation can be performed during system tactical operation without degrading performance quality. (Author)

PB 158 853 $7.60

General Electric Co., Schenectady, N. Y.
DEVELOPMENT OF ELECTRICAL-OUTPUT RECORDING STORAGE TUBE, by B. E. Day. Final rept. 1 July 56-15 Dec 59, on Contract DA 36-039-sc-73017. [1959] 74p. 5 refs; AD-239 526

DESCRIPTORS: *Storage tubes, Design, Electron tubes, Electrostatic fields, Thin films, Electron optics, Insulating materials.

The design and development of a two-, and a three-gun electrostatically focused and deflected storage tube is presented. A two-gun storage tube with the magnetically focused and deflected image orthicon readout is described. Target developments are also presented. (Author)

PB 156 657 $2.60

Granger Associates, Palo Alto, Calif.
ANTENNA AS-1019(XE-1)/TRD. Final rept. on Design and Fabricate 50-320 Mc DF Antenna, Contract DA 36-039-sc-84533. 30 Dec 60, 27p. AD-254 830.

DESCRIPTORS: *Antenna, *Direction finding, *Radio equipment, Manufacturing methods, Design, Model tests, Very high frequency, Antenna radiation patterns, Ultra high frequency.

Two model antenna systems were developed which met or exceeded the intent of the governing specifications. Although the VSWR exceeds the specifications in isolated instances, the system sensitivity is within specifications since the gain is somewhat greater than required. Recommendations are listed which will improve the VSWR and thereby improve the over-all performance of the system. Considerable effort was expended to make these units simple to erect, maintain, operate and disassemble. Improvements which became apparent as the program progressed are itemized as suggestions for further production models. (Author)

PB 158 818-1 $6.60

International Resistance Co., Philadelphia, Pa.
RESISTORS, FIXED FILM TYPE, GENERAL PURPOSE, by B. Ingster. Quarterly progress rept. no. 1, 8 June-30 Sep 59, on Contract DA 36-039-sc-81283. [1959] 64p. AD-239 596.

DESCRIPTORS: *Fixed resistors, *Resistors, Manufacturing methods, Films.

The purpose of this contract is to establish a production facility with the capacity necessary to manufacture a minimum of 25,000 each of 1/4 watt (RC^{07}) and 1/2 watt (RC^{20}) resistors per eight (8) hour shift. In addition to other performance tests, the resistors must pass (1) a moisture resistance (10 cycles) test with a performance goal of + 3.0% and (2) a load life test at 100° C for 2000 hours with a performance goal not to exceed 6% for individual units while the average of the groups is not to exceed 3%. Evaluation of the RC^{07} style 1/4-watt resistor process was started using experimental equipment and hand operations. The use of chromium film for the lower resistance values (10 ohm - 1000 ohm) was investigated. The intermediate range (300 ohm - .25 megohm) element process was determined to be similar to that used for the RC^{20} style. Development of high resistivity films (above 10 megohm) was conducted. Development work on improved contact paints and overcoat materials was done. Forms have been prepared for use in process evaluation. The design of the filament machine has been established, and the design of the other production facilities is proceeding on schedule. A new experimental mold is in operation, but the operating parameters have not yet been determined. (Author)

PB 158 818-2 $3.60

International Resistance Co., Philadelphia, Pa.
RESISTORS, FIXED FILM TYPE, GENERAL PURPOSE, by William F. Ebling and Jerome G. Burns. Quarterly progress rept. no. 2, 1 Oct-31 Dec 59, on Contract DA 36-039-sc-81283. [1960] 36p. AD-239 598.

DESCRIPTORS: *Fixed resistors, *Resistors, Manufacturing methods, Films.

The low range chromium films can be deposited over a wide range of temperatures (350°C to 1000°C). This means that the deposition process is not sensitive to temperature variation. Low range contact resistance plays an important role with these films, and means for minimizing the termination resistance must be developed. The intermediate range resistor process for RC07 style resistors appears feasible. The two major areas requiring improvement are terminal strength and moisture resistance. It is believed that terminal strength failure can be overcome by appropriate mechanical design. The high and low ranges need further development and test. The moisture resistance problem does not appear to be insurmountable. The use of appropriate contact paint, selection of optimum spiralling magnification, and more uniform assembly techniques are expected to improve the moisture resistance problem. (It should be noted that the initial run of RC07 resistors was processed by hand on unfinished, experimental equipment, and with additional experience and refined facilities, most of the deficiencies observed will be corrected.) Further improvement in moisture resistance was obtained by using two thicknesses of overcoat and by using more reliable curing catalysts to insure this curing. (Author) (See also PB 158 818-1)

PB 155 372 $2.60

Litton Systems, Inc., College Park, Md.
DIRECTION FINDER GROUP OA-(XE-1)/VRD, by J. DeStefano. Quarterly progresss rept. no. 1, 1 July-30 Sep 60, on Contract DA 36-039-sc-84961. [1960] 25p. AD-246 748.

DESCRIPTORS: *Direction finding, *Antennas, Radomes, Azimuth, Microwave equipment, Electromagnetic waves, Design, Servo systems, Parabolic antennas

Research is concerned with the design, development and fabrication of a rapid scan microwave search and direction finder group capable of intercepting and determining the azimuth bearings of electromagnetic signals in the frequency range of 1.0 kmc to 10.75

kmc. The primary portion of the group consists of an antenna, high speed pedestal, memory type CRT indicator and servo control unit. A second pedestal will be provided to support and rotate the following units. (1) Antenna Assembly AN/TLA-( ), (2) A four foot parabolic reflector and feed assembly, or (3) any antenna assembly, with a maximum weight of 75 pounds. The final design plan of the program has been submitted for approval and negotiations are presently under way for an antenna assembly and radome. Final design of the pedestals has begun. The Control Indicator Unit is in the breadboard design stage, with all circuits operating satisfactorily. The unit is composed of the following major systems; video processing, memory cathode ray tube and control, high voltage power supplies, video resolver and deflection system, video resolver servo system, and an azimuth control servo system. (Author)

PB 157 317 $6.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
THE DELAY-LOCK DISCRIMINATOR: AN OPTIMUM TRACKING DEVICE, by J. J. Spilker, Jr. and D. T. Magill. Technical rept. on Communications. Mar 61, 62p. 18 refs. LMSD-894802; AD-254 043.

DESCRIPTORS: Statistical analysis, *Delay circuits, *Discriminators, Tracking, *Interferometers, Quantitative analysis, Effectiveness, *Radar tracking, Radar equipment, *Radar signals, Band pass filters, Low pass filters, Electronic circuits, *Delay lines, Design, *Position finding, Radar pulses, Correlation techniques, Radiofrequency filters, Signal to noise ratio, Radar targets

The delay-lock discriminator is a statistically optimum device for the measurement of the delay between two correlated waveforms. This new device seems to have important potential in tracking targets and measuring distance, depth, or altitude. It operates by comparing the transmitted and reflected versions of a wide-bandwidth, random signal. The discriminator is superior to FM radars in that it can operate at lower power levels; it avoids the so-called "fixed error," and it is free of much of the ambiguity inherent in such periodically modulated systems. It can also operate as a tracking interferometer.

PB 157 319 $11.50

Lockheed Aircraft Corp., Sunnyvale, Calif.
MICROMINIATURE OSCILLATORS. AN ANNOTATED BIBLIOGRAPHY, by George R. Evans. Mar 61, 155p. 251 refs. Special research bibliography SRB-61-1; AD-254 504.

DESCRIPTORS: *Bibliography, *Subminiature electronic equipment, *Oscillators, Transistors, Electronic circuits, *Miniature electronic equipment, Autiofrequency oscillators, Crystal oscillators, Feedback oscillators, *Harmonic oscillators, Radiofrequency oscillators, Relaxation oxcillators.

This annotated bibliography contains 351 abstracts of articles and reports written on microminiature oscillators since 1950. The bibliography is divided into 4 major parts: (1) oscillators, (2) multivibrators, (3) convertors, and (4) generators. References from foreign and domestic publications are included. Microwave oscillator research is not included.

PB 157 545 $2.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
STUDIES OF THE PERFORMANCE OF ELECTRONIC COMPONENTS UNDER DEEP OCEAN PRESSURES, by L. B. Wilner. Technical note on Communications. Feb 61, 23p. LMSD-894807; AD-254 606.

DESCRIPTORS: Electronic equipment, Pressure, *Electronic circuits, Test equipment, Tests, *High pressure research, Reliability, *Resistors, *Capacitors, *Transformers, *Coils, *Diodes, Measurement, *Transistors, *Storage batteries, *Failure (Mechanics), Instrumentation, Oceanography, *Thermistors.

Research is concerned with the development of up-to-date oceanographic instrumentation. The present study relates to components used under pressure in solid-state circuitry. Pressed composition resistors decreased their resistance quite strongly as a function of pressure; the pressure dependence varied with resistance and, to a certain extent, varied from unit to unit. A test varying both temperature and pressure showed an apparent change of thermal sensitivity with pressure in a thermistor. Capacitors in sealed tubular cases which included some void space tended to be damaged by mechanical deformation. The glass shells on crystal diodes withstood pressure in some cases; diodes in metal cases invariably collapsed. The primary effect of pressure on transistors was collapse of unfilled cases. Zinc-carbon batteries tended to be deformed by pressure; mercury cells tended to admit hydraulic fluid under pressure; but lead-acid and other liquid electrolyte cells functioned normally under pressure if buffered against the intrusion of foreign material. Circuits tried under pressure generally continued to function, but they showed some changes from the pressure. (Author)

PB 156 966 $8.60

Mallory, P. R., and Co., Inc., Indianapolis, Ind.
HIGH POWER 400 CYCLE VIBRATORS AND ASSOCIATED TEST POWER SUPPLIES DEVELOPMENT, by Arthur J. Little and William E. Rigsbee. Final rept. 15 Dec 58-15 Dec 59, on Contract DA 36-039-sc-78257. [1959] 99p. 12 refs. AD-254 846.

DESCRIPTORS: *Miniature electrical equipment, *Vibrators, Power supplies, Conductivity, *Miniature electronic equipment, Reliability, Design, Life expectancy, Specifications, Tests, Electrical equipment, Electronic equipment

A vibrator of rather unique design, employing a torsion hinge, was developed. This design provides excellent heat and current conductivity mainly by means of wires running along the theoretically motionless centerline of the hinge. It also provides a perfectly balanced vibrator that is unaffected by extremes of shock, vibration and acceleration. Two problems were predominant during testing for life and power ratings: (1) The self-rectifying vibrators were afflicted by a tendency to draw a running flare and the interrupter models by starting flare, and (2) Interrupter models, in particular, tended to transfer badly. The first problem was completely solved though it involved a decrease in the power rating of the vibrators.

The second was practically solved but is still the limiting factor in interrupter life. At present these vibrators are not completely reliable, however, performance of this vibrator is much better than that of standard vibrators. Size and weight are excellent in comparison with existing vibrators. (Author)

PB 158 817 $5.60

McCoy Electronics Co., Mount Holly Springs, Pa.
COMPLETION AND EVALUATION OF AN EXPERIMENTAL MANUFACTURING FACILITY FOR CR-54/U QUARTZ CRYSTAL UNITS. Final engineering rept. 31 May 56-31 May 59, on Industrial Preparedness Study on CR-54/U Crystal Units, Contract DA 36-039-sc-70290. 31 May 59, 59p. AD-226 306.

DESCRIPTORS: *Quartz crystals, Production, *Crystal units, *Industrial equipment, Processing, *Miniature electronic equipment, Design, Manufacturing methods, Crystals.

An experimental manufacturing facility for producing CR-54/U quartz crystal units was evaluated with respect to: (1) the mounting plates to be used in the cutting and orientation phases, (2) the polariscope to be used in aligning the quartz, (3) the cut-off saws, (4) a CAZ-1A beam detection device, (5) a CIF-1A magazine feed, (6) the polishing operation, (7) the ultrasonic cleaning operation, (8) base plating, and (9) frequency plating. Temperature testing was conducted with the following basic components: (1) the TX-683/TSM crystal impedance meter; (2) a signal mixer; (3) a GO, NO-GO relay limit panel; and (4) an AF-1 Health kit audio frequency meter. In general, the devised system was considered to be excellent. Recommendations for changes were made to enhance production output, quality, and repeatability.

PB 158 766 $9.10

Melabs, Inc., Palo Alto, Calif.
A REAL-TIME STORAGE/DISPLAY SYSTEM FOR PANORAMIC SEARCH RECEIVERS, by R. E. Andrews and C. A. M. Prior. Technical rept. on Contract AF 30(602)1780. Sep 59, 107p. RADC-TR-59-182; AD-233 774.

DESCRIPTORS: *Storage tubes, Circuits, Radio interception, Radio equipment, *Display systems, Design, Timing circuits, *Panoramic scanners

This report describes the design considerations and development of Indicator Group AN/GLX-10 (XW-1), a display unit presenting simultaneously the frequency (or azimuth) strength, duration and recurrence of signals received during 300 receiver scans, resolving up to 200 signals per scan. Signal frequency is displayed on the X-axis of a cathode-ray tube, and real time on the Y-axis. A register of the frequency of all past signals received over a controllable period of 1.5 to 150 seconds is also presented, and a record of locked-out sectors. An automatic alarm operates when a signal is received in a previously-unoccupied sector, but adjustable lockouts can over-ride this feature in any sectors. A single gun electrostatic storage tube is used with simultaneous readout and flickerless display, one Y-line each 64 usec, 357 lines/frames, 44 frames/sec. A novel readout system minimizes ion-spot interference. Writing occurs in the intervals between readout lines, and a blanked line indicates "now" time on the display. The system comprises a display unit and three others, total weight 180 lbs. Test results were satisfactory, but performance could be improved, by better storage and lockout technique. (Author)

PB 155 740 $1.60

Microwave Associates, Inc., Burlington, Mass.
HIGH POWER C-BAND BEACON MAGNETRON RESEARCH AND DEVELOPMENT PROGRAM, by D. Hobbs. Quarterly progress rept. no. 4, 1 Apr-30 June 60, on Contract DA 36-039-sc-78934. [1960] 19p. AD-251 357.

DESCRIPTORS: *Magnetrons, C band, Tests, Design, Electric fields, Magnetic fields, Anodes (Electron tubes), Ceramic materials, Cathodes (Electron tubes).

Continued progress is reported on the C-Band beacon magnetron. Discussion of further tube construction and testing is given. Several tubes were built. Excessive leakage current was the main cause of failure of completed tubes. The major problem was a ceramic cracking problem. Discussion of the work on this problem is given. (Author)

PB 155 737 $1.60

Microwave Associates, Inc., Burlington, Mass.
HIGH REPETITION RATE BROADBAND DUPLEXER, by Emanuel L. Horn. Quarterly progress rept. no. 8, 15 May-15 Aug 60, on Contract DA 36-039-sc-78165. [1960] 11p. AD-250 890.

DESCRIPTORS: *Radar duplexers, Radar equipment, Broadband, Klystrons, Design, S-band, Electron tubes, Manufacturing methods

The lack of high power instrumentation during this interval delayed input window design evaluations and thus the entire tube design. A new klystron was received and is almost operational. The problems associated with fabrication of the quartz wafer window and the tuned encapsulated element were resolved and satisfactory assemblies were produced. (Author)
(See also PB 147 428)

PB 156 564 $6.60

Microwave Associates, Inc., Burlington, Mass.
INVESTIGATION OF DUPLEXING TECHNIQUES AT HIGH DUTY CYCLE CONDITIONS, by Harold S. Maddix. Final rept. on Contract DA 36-039-sc-78233. [1960] 63p. AD-254 334.

DESCRIPTORS: *Radar duplexers, Gas discharges, Ferrites, *Semiconductors, *Phase shifters, Quartz, Limiters, Diodes, *Microwave equipment, Electronic switches, Switching circuits, Electronic circuits, Transmit-receive tubes, X band, Radar equipment, Life expectancy, Theory, Design, Tests

The various aspects of duplexer switching and protection at high duty cycle conditions were investigated using different arrangements of gas discharge, ferrite, and semiconductor devices. High power results are presented for phase shift, Y, and T ferrite circulators. The performance of a high average power

quartz capsule gas discharge structure is discussed. Crystal protector results are given for gas discharge, ferrite limiter, and varactor diode devices. (Author)

PB 158 850 $6.60

Naval Ordnance Plant, Indianapolis, Ind.
REPORT ON SERVO SYSTEMS USING AMPLIFIER MK 47 MOD 0, by Paul Wible. 19 June 53, declassified, 61p. NAVORD rept. 1430.

DESCRIPTORS: Aircraft fire control systems, *Servo systems, *Amplifiers, *Modulators, *Power supplies, Design

Information is presented herein concerning the design and performance of Amplifier Mk 47 Mod 0 and a companion modulator and power supply. These components were designed as universal units for use in the high performance servos found in aircraft fire control equipment and the environmental condition encountered in these applications. Each unit is as small and light as is consistent with reliability and performance. Test results presented herein indicate that when used together it is possible to readily obtain high performance stable servo systems but no one unit is dependent for operation on the other two. Rather they are intended as building blocks readily adaptable to various applications and are not specialized components. (Author)

PB 158 742 $1.60

Navy Electronics Lab., San Diego, Calif.
AN ELECTRICAL PHASE SHIFTER AND METER, by J. T. Redfern. 9 Mar 55, 13p. 3 refs. Research and Development rept. 591.

DESCRIPTORS: *Electric meters, *Phase shifters, *Phase meters, Design, Wiring diagrams, Circuits, Tests, Meters.

The instrument described will determine the phase between two sinusoidal voltages which do not need to be separated from accompanying noise. It also can be used to shift the phase of a sinusoidal voltage by any angle between 0 and 360 degrees. Accumulated phase error is less than + 1 degree. The operating frequency range is between 7.5 and 2500 cps. Phase angle is read from the mechanical position of a sine-cosine potentiometer which is set by a null type of comparison. (Author)

PB 158 513 $12.00

Office of Scientific Research and Development. Div. 14.
BIBLIOGRAPHY OF DIVISION 14 AND RADIATION LABORATORY REPORTS. Summary technical rept. vol. 3, Contract OEMsr-1131. 1946, declassified 23 Apr.58. 168p. 1,078 refs. AD-200 802.

DESCRIPTORS: *Radar, *Scientific reports, *Loran, *Microwaves, *Navigation, Indexes, *Bibliography, *Radar equipment, Radio equipment.

TID-3566 $1.25

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
MASERS. A LITERATURE SEARCH, comp. by Henry D. Raleigh. Aug 61, 51p.

AD-258 579 repriced $1.25

Ohio State U. Research Foundation, Columbus.
SOLID-STATE LOGICAL TRANSDUCERS, by F. E. Battocletti, A. C. Thomas and others. Rept. on Contract AF 33(616)6416 continuation of Contract AF 33(616)5923. Feb 61, 41p. 16 refs. WADD Technical rept. 60-774.

DESCRIPTORS: *Electronic circuits, *Electronic switches, *Transducers, *Switching circuits, Algebra, Mathematical analysis, Mathematical logic, Transistors, Vector analysis, *Diodes, *Triodes, Negative resistance circuits, Waveform generators, Classification, Semiconductors, Solid state physics, Theory.

One central problem in switching function theory is the classification of all binary switching functions of a given number of input variables into equivalence classes by rearrangement and negation of the input variables. Several theorems describing properties of the switching functions which result in various types of symmetries of the functions under input rearrangement and negation are presented. The analysis is based on the representation of the switching function in terms of set of vectors from a finite dimensional vector space over the field of integers modulo 2. This approach makes use of the properties of the groups of transformations on the vector space which are related to the input rearrangements and negations. One type of solid-state logic unit investigated was the field-effect transistor with 2 control gates located concentrically around the source terminal. Another approach to the problem of realizing multiple input logic functions is to employ 4-layer diodes coupled internally in a single piece of semiconductor. A number of 4-layer diodes were fabricated and tested with external coupling. (Author)

PB 156 219 $6.60

Radio Corp. of America, Somerville, N. J.
108-mc, 10-WATT SILICON TRANSISTORS, by S. Daskam and L. T. McCloskey. Final rept. 1 June 59-31 Oct 60, on Contract DA 36-039-sc-78325. [1960] 66p. 21 refs. AD-253 689.

DESCRIPTORS: *Transistors, Silicon, Manufacturing methods, Diffusion, Bonding, Production, Measurements, Processing, Electrical properties, Aluminum, Very high frequency, Design, Radiofrequency oscillators, Oscillator circuits, Semiconductors.

The purpose of this research was to develop a high temperature silicon transistor for Class C amplifier operation at a frequency of 108 mc with an RF output of 10 watts. The heavily doped collector layer is formed by diffusion of phosphorus approximately 3.5 mils into the high resistivity n-type wafer. The base impurity

source is placed on the wafer. After a time, the diffusion is interrupted and a donor impurity is deposited on the surface within a defined emitter area. In a third diffusion step, both impurities diffuse simultaneously and a second junction is formed. After diffusion, appropriate masking techniques are employed and metalized layers are put on the emitter and base areas. The wafer is then diced into individual units using either scribing or etching techniques. The contacts to the base and the emitter regions are then attached by thermocompression bonding techniques. (Author)

AD-258 313 $3.60

Raytheon Co., Burlington, Mass.
STUDY OF PLATINOTRON DEVICES. Final technical rept. 1 Jan-31 Oct 60, on QKS779, Contract DA 36-039-sc-87181, continuation of Contract DA 36-039-sc-78229. [1960] 39p.

DESCRIPTORS: *Electron tubes, *Microwave amplifiers, Amplifiers, Broadband, Extremely high frequency, Frequency, Design, Tests.

SCR-440 $0.50

Sandia Corp., Albuquerque, N. Mex.
BIT RATE GENERATOR AND RAW DATA CONDITIONER, by S. C. Steely. Sep 61, 14p.

SCTM-209A-53(52) $0.75

Sandia Corp., Albuquerque, N. Mex.
CALIBRATION OF A PEAK CURRENT GAGE DEVELOPED AT SANDIA CORPORATION, by G. E. Baker, T. C. Looney and others. Aug 61, 37p.

PB 150 821 $3.60

Stanford Electronics Labs., Stanford U., Calif.
A KILOWATT-PULSED TRAVELING-WAVE TUBE FOR X-BAND, by W. R. Luebke. Rept. on Contract AF 33(616)6207. 29 July 60, 33p. 8 refs. Technical rept. no. 105-1; AD-243 293.

DESCRIPTORS: *Traveling wave tubes, X-band, Design, Tests, Manufacturing methods, Seals, Glass seals, Molybdenum, Broadband, Helixes, Aluminum compounds, Silicates, Oxides.

Research is concerned with the design and construction of high-power, wide-band traveling-wave tubes of minimum size and weight. The approach followed was to design tubes for operation at beam voltages several times higher than normally used. The general philosophy of such an approach is discussed and a particular design for the kilowatt (pulsed) level at X-band is described. The circuit used is a bifilar helix with stop bands operating at a frequency above the first stop band. Test data are presented on a number of tubes which have been constructed. The experimental results fall short of the design goals, but the essential features of the design problem have been worked out, and it is believed that a satisfactory kilowatt tube using this circuit could be designed on the basis of the work presented. Some new fabrication techniques for seals of molybdenum to high-temperature glass are discussed. (Author)

PB 158 847 $1.60

Stromberg-Carlson-San Diego, Calif.
APPLICATION OF NEW MATERIALS AND TECHNIQUES IN ELECTRON GUN FABRICATION. Interim development rept. 1 Apr-30 June 60, on Contract NObsr-81208. 18 July 60, 19p. AD-241 292.

DESCRIPTORS: *Electron guns, Design, Materials, Manufacturing methods, Production, Mica, Machining, Tests, *Cathode ray tubes, Molding, Coatings, Conductivity, Ceramic materials.

The purpose of the research and development program that will seek to employ new materials and apply new techniques to the production of cathode-ray tube guns, in order to overcome present limitations in ruggedness and precision. Studies during this period reaffirmed the feasibility of producing electron guns by machining a suitable insulating material to conform to the gun configuration. Since this material is moldable, the feasibility of a molded gun has also been established. A conductive coating is applied to the basic structure so that the conducting areas duplicate the metallic elements present in guns of conventional construction. An investigation has been conducted to select the most suitable material for this application. Glass-bonded mica meets the requirements and can be machined or molded. Its physical characteristics include electrical qualities which are favorable for its use in this application. Experience has demonstrated that its vacuum characteristics are satisfactory. A mold has been designed to produce longitudinal halves of an electron gun. These halves when joined will form a gun whose characteristics are equivalent to those of the 5AQP. Related activities include machined test guns, gun redesign, and testing of materials and techniques applicable to formed cathode-ray tube structures. (Author)

PB 158 848 $1.60

Stromberg-Carlson-San Diego, Calif.
APPLICATION OF NEW MATERIALS AND TECHNIQUES IN ELECTRON GUN FABRICATION. Interim development rept. 1 July-30 Sep 60, on Contract NObsr-81208. 18 Oct 60, 14p. AD-246 009.

DESCRIPTORS: *Electron guns, *Cathode ray tubes, Mica, Glass, *Machining, *Moulding, Coatings, Design, Materials, Manufacturing methods, Production, Tests.

The first 5AQP tube for the machined glass-bonded mica gun has been completed. The tube operated satisfactorily except for an astigmatism. A second gun was machined and has been used to determine the measures necessary to correct the astigmatism. The causes of the astigmatism have been determined and the second machined gun is ready for installation in a tube. The gun mold is nearly finished, and molded guns are expected in the near future. (Author) (See also PB 158 847)

PB 158 849 $1.60

Stromberg-Carlson-San Diego, Calif.
APPLICATION OF NEW MATERIALS AND TECHNIQUES IN ELECTRON GUN FABRICATION. Interim development rept. 1 Oct-31 Dec 60, on Contract NObsr-81208. 18 Jan 61, 11p. AD-251 464.

DESCRIPTORS: *Electron guns, Cathode ray tubes, Mica, Production, Manufacturing methods, Design, Molding, Configuration, Cylindrical bodies.

Two 5AQP tubes with machined glass-bonded mica guns have been completed and operate satisfactorily. A tube with a molded gun has been constructed and while operation was adequate, it does not exemplify the capabilities of molded guns. Methods of locating and fastening apertures of Phase II have been devised and a satisfactory gun design is being evolved. (Author) (See also PB 158 848)

PB 158 777 $1.10

Thompson Products, Inc., Cleveland, Ohio.
[S-BAND WAVEGUIDE SWITCH MEASUREMENTS] by R. F. Schneider. Interim letter progress rept. no. 4 for 15 Jan-15 Mar 55 on Contract AF 30(602)1252. 8 Apr 55, 9p. RADC-TN-185; AD-69 281.

DESCRIPTORS: *Waveguide switches, Tests, X-band, Phase measurement, Waveguides, Switches

High-pulse power testing of the X-band waveguide was continued. The directional coupler breakdown was eliminated by the use of a broadband directional coupler which has coupling apertures in the narrow waveguide. The effective power rating was varied by keeping the magnetron power fixed and varying the pressure in the waveguide. The power testing was started at a low effective breakdown power by pressurizing the waveguide to 30 psig. Pressure was decreased in decrements of 5 psig to increase the effective breakdown power. Three switches were tested: an X-band type of the RG(52)/U waveguide size; an all-aluminum waveguide switch; and a chrome-plated aluminum switch in the RG(51)/U size. Arcing was identified only by microscopic examination of the switch parts. No audible arc sounds were detected during power testing. A change in pulse shape could not be associated with the arcing. Arcing is probably not a complete breakdown, but a sputtering or spitting of the switch originally caused by foreign particles. The peak pulse power was measured by the average-power method. The pulsewidth was measured with a Tektronic oscilloscope. The pulse was detected by an IN23B Si diode; the pulse shape was good. The directional coupler had a coupling factor of 30.2 db at 9.375 kmc. The total attenuation loss was 54.0 db. The X-band RG(51)/U waveguide size switch was plated with chrome about 0.001-in. thick. The S-band switch was built of 24S-T4 aluminum alloy.

PB 158 804 $4.60

Washington U., Seattle, Coll. of Engineering.
CROSS MODULATION IN TRAVELING-WAVE TUBE AMPLIFIERS, by Arthur W. C. Nation and A. E. Harrison. Technical rept. no. 15 on Microwave Tube Studies, Contract N8onr-52012. 15 Dec 54, 46p. 5 refs. AD-52 900.

DESCRIPTORS: *Traveling wave tubes, *Radio interference, Signal-to-noise ratio, Microwave amplifiers, Frequency modulation, Amplifiers, Signals.

Equipment and techniques for measuring intermodulation in microwave amplifiers have been developed and tested. The method is applicable to both small-signal and large-signal conditions. Preliminary experimental results of the cross modulation produced on the desired signal in a traveling-wave tube amplifier by an interfering signal are presented and compared with theoretical predictions. The extension of small-signal theory to the large-signal case is discussed briefly. (Author)

PB 158 809-1 $1.60

Watkins-Johnson Co., Palo Alto, Calif.
RESEARCH ON O-TYPE BACKWARD-WAVE OSCILLATORS FOR HIGH POWER, by William V. Christensen, H. Richard Johnson, and James W. Sedin. Scientific rept. no. 1, Dec 58-Feb 59, on Contract AF 33(616)6159 31 Mar 59, 11p. File no. W-J59-310R3; AD-213 406.

DESCRIPTORS: *Backward-wave oscillators, *Microwave oscillators, K-band, Design, *Electron tubes, *Electronic circuits, Tests, *Electron guns.

Efforts were made to demonstrate the feasibility of generating large amounts of c-w microwave power through the use of a variation of the O-type backward-wave oscillator. Calculations have indicated that this device should be capable of about an order of magnitude more average power than can be obtained from the M-type backward-wave oscillator at any frequency, or that it should be capable of operation at about three times as high a frequency as the M-type device at any fixed power level. The difficulties of low efficiency and large magnet which are reputed to be intrinsic problems of the O-type oscillator will be eliminated through the use of a depressed collector and a modification of Brillouin focusing. Holes or gaps in the frequency coverage and short life, problems of the M-type device, should not be encountered here because of the excellent theoretical understanding of the O-type device and because of its low cathode loading. Complete working drawings for the use of a modified folded-line circuit, depressed collector, and electron gun of mieroperveance 1 were completed. Fabrication of a considerable number of parts was completed as was the design of the test arrangement.

PB 158 809-2 $1.10

Watkins-Johnson Co., Palo Alto, Calif.
RESEARCH OF O-TYPE BACKWARD WAVE OSCILLATORS FOR HIGH POWER, by William V. Christensen, H. Richard Johnson, and James W. Sedin. Scientific rept. no. 2, Mar-May 59, on Contract AF 33(616)6159. 30 June 59, 7p. File no. W-J 59-310R7; AD-218 831.

DESCRIPTORS: Backward-wave oscillators, *Microwave oscillators, K-band, Design, *Electron tubes, *Electronic circuits, Tests, *Electron guns.

Progress is reported toward fabricating and assembling the various tube components and test facilities that were designed during the first quarter. The gun, collector, windows, and matching sections are complete. The circuit assembly problems appear to be under control and the test facilities will be ready in time for the first tube. (Author)

PB 158 809-3

Watkins-Johnson Co., Palo Alto, Calif.
RESEARCH OF O-TYPE BACKWARD WAVE OSCILLATORS FOR HIGH POWER, by Charles A. Arnold and James W. Sedin. Scientific rept. no. 3, June-Aug 59, on Contract AF 33(616)6159. 30 Sep 59, 11p. File no. W-J 59-310R11; AD-226 334.

DESCRIPTORS: *Backward-wave oscillators, *Microwave oscillators, K-band, Design, *Electron tubes, *Electronic circuits, Tests, *Electron guns.

The objective of the work on this contract is to demonstrate the feasibility of generating large amounts of c-w microwave power through the use of a variation of the O-type backward-wave oscillator. Calculations have indicated that this device should be capable of about an order of magnitude more average power than can be obtained from the M-type backward-wave oscillator at any frequency, or that it should be capable of operation at about three times as high a frequency as the M-type device at any fixed power level. The difficulties of low efficiency and large magnet which are reputed to be intrinsic problems of the O-type oscillator will be eliminated through the use of a depressed collector and a modification of Brillouin focusing. Holes or gaps in the frequency coverage and short life, problems of the M-type device, should not be encountered here because of the excellent theoretical understanding of the O-type device and because of its low cathode loading. This report describes the progress that was made toward completing the first tube. All the tube components were completed and final assembly partially completed. Two electron gun testers were built and tested. The testing included focus electrode biasing. (Author)

PB 158 812 $3.60

Watkins-Johnson Co., Palo Alto, Calif.
RESEARCH OF O TYPE BACKWARD-WAVE OSCILLATORS FOR HIGH POWER, by Charles A. Arnold, H. Richard Johnson, and James W. Sedin. Final scientific rept. Nov 58-Dec 59, on Contract AF 33(616)6159. 31 Dec 59, 36p. File no. W-J 59-310R15; AD-235 036.

DESCRIPTORS: *Backward-wave oscillators, *Microwave oscillators, K band, Design, *Electron tubes, *Electronic circuits, Tests, *Electron guns.

This report describes the results of a one year program to demonstrate the feasibility of building a long-life, 100 watt c-w O-type backward-wave oscillator capable of tuning over the frequency range 14.9 to 18.1 kMc with a voltage swing of about two to one. The major problem in this program was the design and construction of a suitable circuit for this high frequency and high average power. A modified version of a folded waveguide or an interdigital line was selected. The electron gun was built with an insulated focus electrode that could be used for current control purposes. A tube was tested on a pulsed basis and produced 20 watts of average power. Poor gun alignment resulted in about 25 percent current interception on the circuit and the tube could not be tested at full duty. Results obtained at very long pulses indicate that with a properly aligned gun the tube could produce 100 watts c-w. The electron gun was designed with a cathode loading of 2.8 amps/cm^2 and an impregnated tungsten cathode was used. Expected tube life with such a cathode would be in excess of 1000 hours. (Author) (See also PB 158809)

PB 155 246 $5.60

Bliley Electric Co., Erie, Pa.
PRECISION CRYSTAL UNITS FOR SATELLITE USE, by J. M. Wolfskill, R. T. Schlaudecker, and Robert Mouck. Quarterly progress rept. no. 4, 1 Apr -30 Sep 60, on Contract DA 36-039-sc-84556. [1960] 58p. 2 refs. AD-249 327.

DESCRIPTORS: *Quartz crystals, *Crystals, Satellite vehicles, Design, Frequency, Rocket flight, Tests, *Manufacturing methods, *Quartz resonators, Crystal holders, Vehicles

Parallel field crystals display extremely high inductance values and very high Q, as compared to similar crystals which utilize conventional perpendicular field excitation. This current development of the parallel field technique has culminated in the fabrication of numerous experimental units of one mc nominal frequency which display inductances on the order of 60 h and Q values well above 5,000,000. Several potentialities, not yet investigated, indicate that even higher values may well be achieved. A new mounting arrangement is described which incorporates a mask and plating filament for final adjustment of frequency after the units are sealed, and also utilizes a revised system of supporting the crystals themselves. Representative data from the evaluation tests which were performed on experimental units are presented. These data indicate that the finalized designs for the Phase II units are satisfactory, even though the 9th mode and the 11th mode crystals generally exceed the goal value effective resistance requirements. (Author)

PB 156 221 $4.60

Bliley Electric Co., Erie, Pa.
PRECISION CRYSTAL UNITS FOR SATELLITE USE, by J. M. Wolfskill, R. T. Schlaudecker, and Robert Mouck. Quarterly progress rept. no. 5, 1 Oct-31 Dec 60, on Contract DA 36-039-sc-84556. [1961] 42p. 1 ref. AD-252 768.

DESCRIPTORS: *Quartz crystals, *Crystals, Satellite vehicles, Design, Manufacturing methods, *Crystal ovens, Frequency, *Crystal holders, *Quartz resonators, Metals, Vehicles

Primary concern was with the development work on a low power oven on the initial investigation of the Bimetal Compensation Principle. Previous experimentation established that the low power oven was the most desirable approach to the Phase III requirements Investigation has shown that it is not feasible to meet the initial size and power consumption goals of this oven. Apparently a minimum size of approximately 1 1/2 and that the power requirements will be somewhat around 250 milliwatts. Study of the Bimetal Compensation Principle confirmed the initial investigation. Experimental holders were made by which the temperature-frequency excursions of 30 mc, 3rd overtone, AT cut crystals can be kept within 2 ppm over the 30 to 80 C temperature range, and within 5 ppm from 30 to -20 C. These holders use dual bimetal arms to exert pressure at certain points on the

periphery of the crystals, providing a means of relating the pressure to the temperature. Investigation of a new holder design which uses single bimetal arms is now being conducted. (Author) (See also PB 155 246)

PB 158 844 $18.00

Director of Defense Research and Engineering, Washington, D. C.
SHOCK, VIBRATION AND ASSOCIATED ENVIRONMENTS. PART IV. Aug 60, 289p. 108 refs. Bulletin no. 28. AD-244 857.

DESCRIPTORS: Symposia, Vibration, *Aircraft, *Guided missiles, Design, Shock waves, Countermeasures, *Test facilities, Tests, *Reentry vehicles, Instrumentation, Jet plane noise, Measurement, *Jet planes, Impact shock, Thermal radiation, Reinforced concrete, Detectors, Test methods, Test equipment

Theme: Survival of military equipment in a hot war environment. (See also PB 150 286)

PB 158 764 $8.10

Integrated Range Mission, White Sands Missile Range, N. Mex.
CINETHEODOLITE CALIBRATION AND ORIENTATION, by R. P. Lee. Final rept. 8 Apr 57, 86p. 4 refs. AD-143 258.

DESCRIPTORS: *Phototheodolites, Theodolites, Errors, Calibration, Corrections.

The bias (systematic) errors of a theodolite are discussed as they apply to the Askania Cinetheodolite. Methods of measuring the magnitude of the error correction constants, of minimizing certain ones in the field, and of field orientation are presented. Equations for the determination of orientation from target board pictures are derived and discussed. A star calibration procedure is demonstrated by which the magnitude of certain of the systematic error constants of the instrument and the accuracy of its target board array may be found. Recommendations are made for a consistent program involving both Data Reduction and Field Measurements which will give optimum results. Finally, an analysis of the accuracy with which each correction constant can be determined and its effect on observed angles leads to the conclusion that it is potentially possible at present to hold the bias errors after correction to a maximum of about 10 seconds of arc in elevation angles and 20 seconds in azimuth angles unless extreme elevation angles are encountered. (Author)

PB 158 772 $2.60

Military Physics Research Lab., U. of Texas, Austin.
SOME NOTES ON THE EXTERIOR FORCES AFFECTING BALLISTIC MISSILES AND SATELLITES, by Frederich L. Beckner. Rept. on Contract AF 08(603)4536. 28 May 59, 26p. 20 refs. MPRL 478; APGC-TN-60-16; AD-234 370.
DESCRIPTORS: *Guided missiles, Surface to surface, *Satellite vehicles, *Motion, Gravity, *Terrestrial magnetism, Mathematical analysis, *Guided missile trajectories, *Satellite vehicles trajectories.

A brief discussion is given on the forces due to gravitation, atmospheric drag, radiation pressure, and the magnetic and electrostatic field of the earth as they affect the motion of ballistic missiles, long-range bombs, and satellites. The effect of the oblateness of the earth is discussed and an expansion of the earth's gravitational potential in spherical harmonics is given. Charged drag is found to be a significant factor in determining the density of the atmosphere from observations of satellite orbits. It is found that the forces due to meteoric collisions, radiation pressure, and the magnetic and electro-static field of the earth are negligible for a satellite in a circular orbit 500 km above the earth. (Author)

Sanitation and Safety Engineering

HW-68857 $4.60

Hanford Atomic Products Operation, Richland, Wash.
HANFORD PLUTONIUM CRITICAL MASS LABORATORY: NUCLEAR SAFETY, OPERATIONAL LIMITATIONS, INSTRUCTIONS, AND EMERGENCY PROCEDURES, by E. D. Clayton. Mar 61, 48p.

LAMS-2378(Vol. I) $4.00

Los Alamos Scientific Lab., N. Mex.
CHEMICAL DETECTORS, comp. by Evan E. Campbell and Helen M. Miller. A bibliography for the industrial hygienist with abstracts and annotations. Rept. on Contract W-7405-eng-36. Oct 61, 377p.

ORNL-3100 $1.25

Oak Ridge National Lab., Tenn.
DECONTAMINATION OF CELLS 6 AND 7, BUILDING 3019, FOLLOWING PLUTONIUM-RELEASE INCIDENT, by J. R. Parrott. Rept. on Contract W-7405-eng-26. [1961] 50p.

MACHINERY, FABRICATION, AND ACCESSORY EQUIPMENT

AD-257 468 $4.60

Naval Boiler and Turbine Lab., Philadelphia, Pa.
EVALUATION OF FAWICK CORPORATION 7500 HP 10000 RPM PNEUMATICALLY OPERATED CLUTCH, by William H. Hargett. 12 May 61, 50p. 1 ref. Evaluation rept. NBTL Proj. T-59.

DESCRIPTORS: *Pneumatic devices, Clutches, Torque, Tests, *Turbine clutches, Propulsion, Marine engines

The Fawick Corporation Pneumatically Operated Clutch was engaged readily by injection of compressed air into diaphragms, mounted on the driving member, causing them to inflate and make contact with a drum connected to the driven end of the system. It transmitted torque up to 19972 inch pounds (1620 HP at 6000 RPM) without difficulty. However, because of

air leakage in the diaphragms and insufficient clearance between the clutch casing and the outer walls of the diaphragms which can cause rubbing of the two units if unbalance is present when disengaged, the clutch was considered unsuitable for practical application in its present state of development. Design revisions to eliminate these defects are feasible and recommended. (Author)

Manufacturing Equipment and Processes

PB 157 378 $10.50

Princeton U., N. J.
PREFERENCE STRUCTURES AND THE MEASUREMENT OF MILITARY WORTH, by Richard Guenther Davis. Rept. on Contract Nonr-1858(16). 15 Sep 60, 132p. 15 refs. Econometric Research Program research memo. no. 17; AD-246 267.

DESCRIPTORS: *Logistics, *Military operations, Supplies, *Scheduling, Mathematical analysis.

The manipulation of preference information is investigated for determining military worth function in two types of problems: the assignment problem and the inventory problem. Military worth is defined as the general concept of the revenue or utility of military output. In the assignment problem, the assumption is made that there are many items of different types and many uses or activities to which the items may be assigned. Techniques of establishing an order on the possible assignment patterns from elementary preference information are derived. In the inventory problem, alternative stock levels are evaluated in a system where there is more than one inventory point and more than one type of item being stocked at each point. The military worth function is built up on the subjective basis of certain types of elementary preference information.

PB 156 132-2 $6.60

Reactive Metals, Inc., Niles, Ohio.
MANUFACTURE OF HEAT TREATABLE Ti-6Al-4V AND Ti-2. 5Al-16V SHEETS, by P. E. Moorhead, S. R. Seagle, and O. Bertea. Final rept. Part B, 6 Aug 56-31 Dec 60, on Ti-6Al-4V, Contract NOas 56-994-c. Jan 61, 68p. AD-252 111.

DESCRIPTORS: *Titanium alloys, *Sheets, Aluminum alloys, Vanadium alloys, Mechanical properties, Manufacturing methods, Heat treatment, Processing, Production, Rolling mills.

A satisfactory process was developed by Reactive Metals for producing both annealed and heat treated Ti-6Al-4V sheets. Problems in directionality were alleviated. Because of the rapid quench necessary for solution treatment, many problems in solution treatment were encountered. However, these were solved and heat treated sheet was produced that met the DOD specifications. (Author)

MATERIALS

AD-257 844 $1.10

Naval Engineering Experiment Station, Annapolis, Md.
PRESERVATIVE OILS FOR ANTIFRICTION BEARINGS PACKAGED IN TRANSPARENT PLASTIC, by C. J. Stockhausen. 19 June 61, 9p. 5 refs. Evaluation rept. 610268Q.

DESCRIPTORS: *Oils, *Packaging, Plastics, Preservation, Bearings, Cellulose acetates, Humidity cabinets, Corrosion inhibition, Time, Moisture, Effectiveness, Instrumentation.

Three types of preservative oils were investigated for use as filling media in plastic packaging of antifriction bearings. It is concluded that the three oils are satisfactory for this use if they pass the humidity cabinet requirements of their respective specifications.

AD-258 283 $7.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
THE AEROTHERMODYNAMIC BEHAVIOR OF PYROLYTIC GRAPHITE DURING SUSTAINED HYPERSONIC FLIGHT, by E. J. Nolan and S. M. Scala. Mar 61, 75p. 41 refs. Technical Information Series R61SD051.

DESCRIPTORS: *Graphite, Hypervelocity vehicles, Gliders, Aerodynamic heating, Re-entry aerodynamics, *Re-entry vehicles, Hypersonics, Oxidation, Wings, *Heat transfer, Thermochemistry, High temperature research, Thermodynamics, Mechanical properties, Ablation, Temperature, Insulating materials, Thermal insulation, Satellite vehicles, Control surfaces, Refractory materials, Pyrolysis, Crystal structure

Glide vehicles are subjected to prolonged heating for times of the order of several hours. In this paper, a detailed study is presented of the performance of pyrolytic graphite over the surface of the vehicle, including such critical locations as the leading edge and forward stagnation point. The surface oxidation rate and multidimensional temperature response were determined for various glide trajectories. The analysis presented herein clearly demonstrates the outstanding insulating qualities of pyrolytic graphite at high temperature.

PB 158 748 $1.10

Stanford Research Inst., Menlo Park, Calif.
IRRADIATION OF PHENOLIC AND EPOXY RESIN MODEL COMPOUNDS, by Dale E. Van Sickle. Quarterly progress rept. no. 1, 1 Apr-30 June 60, on Contract DA 04-200-ORD-1056. 11 July 60, 9p. 3 refs. Rept. no. 5, SRI Proj. no. SU-3204; AD-240 718.

DESCRIPTORS: *Phenolic resins, *Epoxy resins, *Electron bombardment, *Proton bombardment, *Radiation damage, Deterioration, Phenols, Formaldehyde, Chromatographic analysis, Hydroxides, Diphenylmethanes; Polymers.

Attempts are being made to determine the mechanism of radiative degradation of phenol-formaldehyde resins by an analytical study of selected model compounds which have been subjected to electron bombardment. Proton bombardment is expected to be used on certain model compounds and reinforced resins. Materials chosen for this study include the 2, 2'-, the 2, 4'- and the 4, 4'-dihydroxydiphenylmethanes; two "linear" phenol-formaldehyde polymers obtained by condensation of o- and p- chloro phenol with formaldehyde followed by dehalogenation; and a material known as "tetraphenol". Seven irradiations with the 1-Mev electron source were performed including two runs on saligenin, two on 2, 2'-dihydroxydiphenylmethane, two on 4, 4'-dihydroxydiphenylmethane, and one on 2, 4'-dihydroxydiphenylmethane. Analyses of the gaseous products by mass spectroscopy have been completed for all except the last run; main volatile liquid products of the 2, 2'-dihydroxydiphenylmethane runs have been determined through gas chromatography. The dosimetry of the irradiations has been established with saligenin as the irradiated material. As determined by the cellophane technique, the dose rate for a disc of saligenin of average thickness 0.088 inch is 1.37 x 10^{23} ev/g-hr at the top surface and 0.48 x 10^{23} ev/g-hr at the bottom.

Ceramics and Refractories

NAA-SR-6428 $0.50

Atomics International, Canoga Park, Calif.
DECREPITATION OF BERYLLIUM OXIDE AT HIGH TEMPERATURE, by S. B. Austerman. Rept. on Contract AT(11-1)-GEN-8. Sep 61, 11p.

NAA-SR-6436 $0.50

Atomics International, Canoga Park, Calif.
EFFECT OF PRESSURE AND TEMPERATURE ON THE END POINT DENSITY OF ALUMINA, by J. D. McClelland and E. H. Zehms. Rept. on Contract AT(11-1)-GEN-8. Sep 61, 16p.

NAA-SR-6483 $1.00

Atomics International, Canoga Park, Calif.
TRANSIENT CREEP AND ASSOCIATED GRAIN-BOUNDARY PHENOMENA IN POLYCRYSTALLINE ALUMINA AND BERYLLIA, by R. Chang and L. J. Graham. Rept. on Contract AT(11-1)-GEN-8. Sep 61, 44p.

CEND-140 $0.75

Combustion Engineering, Inc., Windsor, Conn.
THE DEVELOPMENT AND TESTING OF HOMOGENEOUS CERAMIC FUELS, by G. Zuromsky and W. P. Chernock. Quarterly rept. 1 Mar-31 May 61, on Contract AT(30-1)-2379. Sep 61, 33p.

GEMP-4A $0.50

General Electric Co., Cincinnati, Ohio.
HIGH TEMPERATURE MATERIALS PROGRAM. Progress rept. no. 4, Part A, 1 Aug-30 Sep 61, on Contract AT(40-1)-2847. Oct 61, 16p.

OTS SB-479 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
FIBER GLASS AND GLASS LAMINATES (SUPPLEMENT TO CTR-292). Sep 61, 11p. 120 refs. OTS Selective Bibliography SB-479.

DESCRIPTORS: *Glass, *Glass textiles, *Laminated glass, *Laminates, Plastics, *Bibliography.

Lists 120 foreign and domestic references added to the OTS collection during the period November 1958 to October 1961. Covers glass-metal composites; filament wound composites; glass reinforced plastics; glass fiber rocket motor cases; glass-flake laminates; properties at high temperatures; reinforced plastic missile components; fiber-glass reinforcement for concrete; adhesives for laminates among other subjects.

OTS SB-478 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
GLASS (SUPPLEMENT TO CTR-370). Aug 61, 21p. 292 refs. OTS Selective Bibliography SB-478.

DESCRIPTORS: *Glass, Processing, Thermodynamics, Radiation tolerance, Glass capacitors, Glass electrodes, Coatings, Expanded glass, Bibliography.

Lists 292 foreign and domestic references added to the OTS collection during period April 1959 to August 1961. Covers theory of glass structure; glass processing and grinding; high and low temperature properties of glass; radiation resistant glass; glass capacitors, electrodes, and bearings; metal coatings on glass and glass protective coatings on refractory metals; non-oxide glasses, foam glasses, and radiophotoluminescent glasses; glass in sandwich panels; AEC applications of glass, etc.

TID-12617 $0.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
GLASS BEARING FUELS. Notes from the meeting held at the United States Atomic Energy Commission headquarters building, Germantown, Maryland, Jan 61, 10p.

PB 158 768 $8.10

Sperry Gyroscope Co., Great Neck, N. Y.
METAL-TO-CERAMIC SEAL TECHNOLOGY STUDY, by S. Cole, Jr., H. Larisch, and E. Cheatham. Technical note no. 1, 30 June-30 Sep 59, on Contract AF 30(602)2047. Oct 59, 90p. 26 refs. Sperry rept. no. NA-8240-8184-1; RADC-TN-59-370; AD-234 669.

DESCRIPTORS: *Seals, *Metal seals, Tests, Tensile properties, Materials, Ceramic materials, Stresses, Bonding, Thermodynamics, Adhesion, Metals.

After a preliminary literature study, an intensive metalizing investigation was planned and is now in progress. Initially, four ceramic bodies of varying Al_2O_3 content have been selected and are now being

used in this program. Over 200 metallizing compositions were formulated after consideration of thermodynamic principles, and chemical and physical adherence mechanisms. A testing investigation was planned, two phases of which are in progress (peel testing and compression testing). These programs are designed to render data which is to be correlated with standard ASTM tensile tests. New tensile test specimen designs have been accomplished. A stress investigation was planned and is in progress. Theoretical considerations for both thin and thick wall seals have been fabricated and is under investigation for experimental data. (Author)

PB 158 808 $4.60

Sperry Gyroscope Co., Great Neck, N. Y.
METAL-TO-CERAMIC SEAL TECHNOLOGY, by S. Cole, Jr., H. Larisch, and E. Cheatham. Technical note no. 2, 30 Sep-30 Dec 59, on Contract AF 30(602)2047. Jan 60, 50p. Sperry Rept. no. NA-8240-8184-2; RADC-TN-60-53; AD-235 381.

DESCRIPTORS: *Seals, *Metal seals, Materials, Tests, Stresses, Heat treatment, Tensile properties.

A study was conducted to advance ceramic-to-metal seal technology to the point where stronger seals (seals with bond strengths approaching tensile strengths of 25,000 psi, the strength of the ceramic member) can be developed and produced with a higher degree of uniformity and reliability than has been previously attained. The demands for seals with increased electrical, mechanical, and thermal requirements are being imposed by present and future high-power microwave applications, e.g., electron tubes. A literature survey of metal-ceramic seals was completed. Two hundred metallizing mixtures were milled and sintered at various temperatures. Samples sintered at 1500°C were adherence tested; relatively good results were obtained. At least 22 compositions provided better adherence than standard Mo-Mn mixtures. Adherence tests verified the principle that low Al_2O_3 bodies (94-96%) more easily form metallizing bonds than high Al_2O_3 (99.5%), but in all bodies, metallizing composition can affect bonding within a wide range. Other additives appear promising including Ca, Mn, SiO_2, Fe, Zr, Ti, CeO, Li, and various glass additives. The seal stress investigation has predicted the exact stress condition in a circumferential seal. (See also PB 158 145)

PB 155 594 $2.60

Springfield Armory, Mass.
RELATIONSHIP OF PROPERTIES OF SELECTED CEMENTED CARBIDES WITH MACHINING PERFORMANCE, by H. R. Erard. Rept. on Study of Carbide-cutting Wear-resistant Materials Applicable to the Manufacture of Small Arms Weapons and Components. 21 Feb 60, 26p. 3 refs. Rept. no. SA-TR19-1215; AD-253 929.

DESCRIPTORS: *Carbide tools, Cutting tools, Effectiveness, Physical properties, Density, Porosity, Microstructure, Steel, Machining, Tests, Hardness, Grains (Metallurgy), Titanium compounds, Tungsten compounds, Carbides, Binders, Cobalt, X-ray diffraction analysis, Tantalum compounds, Niobium compounds.

An investigation was made to determine the relationship of metallographic, chemical, and physical characteristics of several submitted commercial carbide tool tips. A correlation was made between properties (metallographic, chemical, and physical) and cutting efficiency. This cutting efficiency was determined by tool life. The tips were rated on microstructure; freedom from cracks; density; porosity; thickness of binder; size, type, and distribution of carbide particles. Investigative procedure is described and results discussed. (Author)

Fuels, Lubricants, and Hydraulic Fluids

AD-257 787 $1.60

Aeronautical Engine Lab., Naval Air Material Center, Philadelphia, Pa.
TAFDS, DETERMINATION OF FUEL COMPATABILITY WITH DISPENSING HOSES, by R. H. Shertzer and J. Elomen. Phase 1 rept. on BUWEPS PA NAM-RAPP41201. 24 May 61, 20p. 2 refs. NAMC-AEL-1683.

DESCRIPTORS: *Jet engine fuels, *Aviation fuels, *Fuel hose, Rubber hose, Hoses, Fuel systems, Fuel filters, Quality control, Storage, Tests, Contamination, Physical properties, Chemical properties, Fuels

The effect of various hoses, which are furnished as part of the Marine Corps Tactical Airfield Fuel Dispensing System (TAFDS), on aircraft fuels was investigated. In order to determine the extent and conditions under which aviation fuels may be affected by contact with the rubber hoses of the TAFDS system, the hoses were coupled together and filled with fuel; samples taken periodically were evaluated to determine the extent of degradation. As a result of evaluating the 4-in. diameter hose in contact with JP-5 fuel, it is concluded that fuel pumped through the TAFDS hoses is satisfactory for service use providing adequate filtration of the fuel is accomplished and that provisions are established for recirculating the fuel after eight hours of continuous storage of the fuel in the hoses has taken place. (Author)

PB 158 779 $11.00

Pennsylvania State U. [University Park].
DEAERATION IN AIRCRAFT LUBRICATION SYSTEMS, by Richard G. Cunningham and D. E. Dahlberg. Rept. on Engine Lubrication Subsystem, Contract AF 33(616)358. May 54, 146p. 38 refs. WADC Technical rept. 55-144; AD-62 541.

DESCRIPTORS: *Lubricants, *Degasification, *Lubricating oil deaerators, Aircraft, *Airplane engine oils, Oils, Lubrication.

The tank-type deaerator usually associated with the closed-circuit libication system, as well as the conventional oil tank, functions by gravity separation of air bubbles from oil. Following an evaluation of the literature and previous work, it was concluded that further improvements in deaerating efficiency within a minimum envelope would require use of centrifugal acceleration. Transparent flow models were used to

observe air-oil mixtures subjected to high acceleration (up to 172 g's) by flow inside curved boundaries. Major effort was then concentrated on rotating centrifugal deaerators. A laboratory model (with transparent cylinder for observation) led to design and development of a prototype centrifuge designed for an oil flow of 80 lb/min. A feature of this deaerator is a fluid motor at the aerated-oil inlet, permitting self-powered operation. Deaeration efficiencies of both contrifugal deaerators were high: 85 to 96 per cent, over 90 per cent in most cases. Complete lubrication systems, incorporating the centrifuge, were altitude tested to 70,000 feet with good results.

PB 156 193 $3.60

Princeton U., N. J.
BURNING RATE CONTROL FACTORS IN SOLID PROPELLANTS, by Kimball P. Hall and E. Karl Bastress. Quarterly technical summary rept. no. 6, 1 Apr-30 June 60, on Contract Nonr-1858(32) and ARPA orders 23-59, 23-60, 15 July 60, 33p. 3 refs. Aeronautical engineering rept. no. 446-f; AD-246 442.

DESCRIPTORS: *Solid rocket propellants, *Rocket oxidizers, *Combustion, *Propellant grains, Particles, Temperature, Pressure, *Ammonium radicals, Perchlorates, Polymers, Sulfides, Propellants.

Studies of oxidizer particle size effects on burning rate have continued. Experimental results from unimodal and bimodal particle size distributions in a polysulfide binder are reported; preliminary results with other fuel types are also reported. A new strand burning apparatus has been completed. Burning rate measurements have been conducted at temperatures from minus 100 to 200 degrees F, and operation at considerably higher temperatures is possible. Results of this work are described. Feasibility studies have been made on methods of measuring the response of burning rate to pressure variations. (Author)

PB 158 038 $1.10

Princeton U., N. J.
BURNING RATE CONTROL FACTORS IN SOLID PROPELLANTS, by Kimball P. Hall and E. Karl Bastress. Quarterly technical summary rept. no. 7, 1 July-30 Sep 60, on Contract Nonr-1858(32) and ARPA orders 23-59, 23-60, 30 Nov 60, 10p. Aeronautical engineering rept. no. 446-g; AD-247 467.

DESCRIPTORS: *Solid rocket propellants, *Combustion, Polymers, Sulfides, Oxidizers, Particles, Rocket oxidizers, Propellants.

The method of particle size data presentation is discussed. Particle size distribution can usually be described by a set of 2 parameters which indicate the mean particle diameter and the range of diameters present in the distribution. The parameters under discussion were selected to provide means for easily comparing size distribution without reference to the actual particle size; these are mean diameter and width ratio. The mean diameter is one corresponding to the 50% point on the cumulative weight curve. Width ratio indicates the width of the distribution about the mean and is defined as the ratio of diameters corresponding to the 90 and 10% points on the cumulative weight curve. The investigation of plateau behavior in propellant burning rates was continued. Polysulfide propellants indicated a transition of high pressure behavior as the oxidizer content was increased. Extinguishment occurred at low oxidizer content. The plateau behavior gradually disappeared at the highest oxidizer concentration. (See also PB 156 193)

MATHEMATICS

PB 158 816 $1.60

Chicago U., Ill.
A MULTIPLIER RULE FOR A CLASS OF TWO-DIMENSIONAL VARIATIONAL PROBLEMS, I, by Lawrence M. Graves. Technical rept. no. 7 on Investigations in the Theory of Partial Differential Equations, Contract DA 11-022-ORD-1833. Oct 59, 16p. OOR rept. no. 1444:10; AD-230 147.

DESCRIPTORS: *Partial differential equations, Calculus of variations.

No general proof has been found for a Lagrange multiplier rule for 2-dimensional problems of the calculus of variations. A case is considered where the mixed partial derivatives of second order of some of the dependent variables actually appear in the differential equations. Isoperimetric conditions are also admitted. The proof is based to some extent on the ideas devised by Bliss for simple integral problems. (Author)

PB 158 813 $2.60

Chicago U., Ill.
A MULTIPLIER RULE FOR A CLASS OF TWO-DIMENSIONAL VARIATIONAL PROBLEMS, II, by Lawrence M. Graves. Technical rept. no. 8 on Investigations in the Theory of Partial Differential Equations, Contract DA 11-022-ORD-1833. Oct 59, 23p. 7 refs. OOR rept. no. 1444:11; AD-230 156.

DESCRIPTORS: *Partial differential equations, Calculus of variations

The abstract multiplier rule of Goldstine is shown to apply to the problems considered in the preceding report (AD 230 147), subject to some continuity restrictions. The multipliers of Goldstine may be represented by functions $\lambda(x, y)$ of bounded variation. The proof that the functions λ are absolutely continuous, and their mixed second derivatives are continuous, is presented. (Author)

PB 157 349 $1.60

Hebrew U. (Israel).
BOOLEAN MATRICES AND THEIR APPLICATION TO FINITE AUTOMATA, by J. Giveon. Technical rept. no. 5 on Contract N62558-2214. 3 Sep 60, 16p. 5 refs. AD-250 785.

DESCRIPTORS: *Matrix algebra, Automation, Theory.

PB 157 843 $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
EFFECT OF PRESSURE ON THE INFLUENCE COEFFICIENTS OF SPHERIGAL SHELLS, by G. B. Cline. Rept. on Contract NOrd-17017. Mar 61, 37p. 9 refs. LMSD-800513; AD-254 605.

DESCRIPTORS: *Spheres, *Structural shells, Stresses, *Pressure, Elasticity, Moments, Mathematical analysis, Equations, Bessel functions, *Differential equations, Deformation.

Uniform asymptotic solutions are found for the differential equations governing the symmetric bending of spherical shells of constant thickness subjected to axisymmetric edge loads and internal pressure. The solutions include the effect of nonlinear coupling of the pressure stresses and edge loads. These solutions are used to obtain expressions for the influence coefficients of both a spherical cap and the complementary portion of the sphere. The effect of the pressure coupling on these influence coefficients is presented graphically. (Author)

LAMS-2607 $3.50

Los Alamos Scientific Lab., N. Mex.
THE IVY SYSTEM, by Forrest W. Brinkley, Bengt G. Carlson and others. Rept. on Contract W-7405-eng-36. Oct 61, 371p.

PB 156 287 $1.10

Mathematics Research Center, U. of Wisconsin, Madison.
ON THE ZEROS OF INFRAPOLYNOMIALS FOR PARTLY ARBITRARY POINT SETS, by Morris Marden. Rept. on Contract DA 11-022-ORD-2059. Nov 58, 7p. 4 refs. MRC technical summary rept. no. 54.

DESCRIPTORS: *Polynomials, Convex sets, Topology, Numbers, Theory.

ORNL-2789 $2.75

Oak Ridge National Lab., Tenn.
CORN PONE: A MULTIGROUP, MULTIREGION REACTOR CODE, by W. E. Kinney and R. R. Coveyou. Rept. on Contract W-7405-eng-26. n.d. 178p.

PB 157 379 $1.60

Princeton U., N. J.
THE SYSTEM OF INEQUALITIES $a_{rs} > X_r - X_s$ by S. N. Afriat. Rept. on Contract Nonr-1858(16). 10 Oct 60, 17p. Econometric Research Program research memo. no. 18; AD-248 194.

DESCRIPTORS: *Inequalities, Number theory.

Contents:
Open and closed systems
Chain coefficients
Minimal chains
Derived systems
Triangle inequality
Extension property of solutions
Consistency
Cycle reversibility
Median solutions
Simple systems

AD-257 580 $12.00

RIAS, Baltimore, Md.
NEW METHODS AND RESULTS IN LINEAR PREDICTION AND FILTERING THEORY, by R. E. Kalman. Rept. on Contracts AF 49(638)382 and AF 33(616)6952. [1960] 168p. 45 refs. Technical rept. 61-1.

DESCRIPTORS: Sampling, *Communications theory, *Statistical processes, Radiofrequency filters, Probability, *Statistical analysis, Linear systems, Statistical distributions, Calculus of Variations, Mathematical prediction

Contents:
Introduction
Preview of contents
Historical remarks and acknowledgements
Notation and other preliminaries
The gauss-markov sequence
The gauss-markov process
Axiomatic definition of the gauss-markov sequence and process
A simple prediction problem
Statement and examples of the filtering problem
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Solution of the filtering problem for random sequences
Examples of discrete filtering
Solution of the filtering problem for random processes
Examples of continuous filtering
Minimal variance unbiased estimation
Properties of the variance equation
Appendix A. The pseudo-inverse of a matrix
Appendix B. Gaussian random vectors
References

SCR-423 $2.60

Sandia Corp., Albuquerque, N. Mex.
NORMAL PROBABILITY INTEGRAL ROUTINE: FLOATING OR FIXED POINT, by Zelma E. Beisinger. Aug 61, 23p.

Computing Devices

TID-13782 $6.60

Digital Computer Lab., U. of Illinois, Urbana.
PART I. HIGH SPEED COMPUTER PROGRAM. PART II. CIRCUIT RESEARCH PROGRAM. PART III. DATA REDUCTION METHODS. PART IV. ILLIAC USE AND OPERATION. PART V. IBM-650 USE AND OPERATION. PART VI. GENERAL LABORATORY INFORMATION. Technical progress rept. June 61, 62p.

TID-13677 $4.60

Digital Computer Lab., U. of Illinois, Urbana.
PART I. HIGH-SPEED COMPUTER PROGRAM. PART II. CIRCUIT RESEARCH PROGRAM. PART III. SWITCHING CIRCUIT THEORY. PART IV. DATA REDUCTION METHODS. PART V. ILLIAC USE AND OPERATION. PART VI. IBM 650 USE AND OPERATION. PART VII. GENERAL LABORATORY INFORMATION. Technical progress rept. May 61, 46p.

OTS SB-475 $0.10

Office of Technical Services, Dept. of Commerce, Washington, D. C.
INFORMATION STORAGE AND RETRIEVAL. Aug 61, 13p. 170 refs. OTS Selective Bibliography SB-475.

DESCRIPTORS: *Data storage systems, *Memory devices, *Digital computers, Computers, *Data processing systems, *Documentation, Ferroelectric materials, Bibliography.

Lists 170 reports and translations added to the OTS collection during the period 1959 to Sep 61. Covers information on data storage systems; photomemory storage devices; ferroelectric storage media; high speed information searching; information and documentation theory; mechanized patent searching; mecha nized indexing; information retrieval of metallurgical, chemical, statistical, and other data.

PB 157 593 $7.60

Rochester U., N. Y.
CIRCUIT STUDY USING COMPUTER TECHNIQUES, by T. A. Keenan, G. H. Cohen, and D. Platnick. Final rept. on Contract DA 36-039-sc-75048. 15 July 59, 74p. 31 refs. AD-229-842.

DESCRIPTORS: Radio frequency, *Intermediate frequency amplifiers, Synthesis, Transistors, Circuits, Control systems, *Digital computers, Mathematical analysis, Amplifiers.

A system for synthesizing any frequency up to 60 mc in 5 kc steps is proposed and described. This system is expected to have advantages over existing synthesizers in stability, compactness, use of standard components and ease of maintenance. A second part of this report covers a design procedure using the facilities of the IBM 650 computer to obtain the optimum terminal values for a single-stage transistor IF amplifier. The method allows one to choose a certain stability factor and bandwidth as design specifications, as well as the center frequency. From these values, and the measured transistor matrix parameters, the optimum circuit values are found. The extension to cascaded stages is pointed out, and results are obtained and discussed. (Author)

SC-4586(M) $2.60

Sandia Corp., Albuquerque, N. Mex.
6-C MOTOR LOAD SIMULATOR, by J. P. LaPoint. Sep 61, 31p.

PB 157 775 $8.60

Stanford Research Inst., Menlo Park, Calif.
GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION, by A. E. Brain, C. O. Childress and others. Quarterly progress rept. no. 1, 1 Apr-30 June 60, on Contract DA 36-039-sc-78343. Aug 60, 93p. 26 refs. Rept. no. 1, SRI Proj. 3192; AD-243 752.

DESCRIPTORS: *Data processing systems, *Military requirements, *Documentation, Electronic circuits, Data storage systems, Military research, *Identification systems, Aerial photographs.

Contents:
Application of the techniques of graphic arts and sciences to the simplification of input data
Survey of electronic methods of performing pattern recognition
Construction of a small parallel-connected pattern recognition machine for feasibility studies
Mathematical investigations
The possible application of certain theorems of integral geometry
The logic of practical wiring systems for the improvement of the performance of machines of limited capacity in specific situations
Data storage and retrieval in relation to the special problems of nonalphanumeric graphical data processing

PB 156 547 $4.60

Stanford Research Inst., Menlo Park, Calif.
GRAPHICAL DATA PROCESSING RESEARCH STUDY AND EXPERIMENTAL INVESTIGATION, by A. E. Brain, A. Macovski and others: Quarterly progress rept. no. 3, 1 Oct-31 Dec 60, on Contract DA 36-039-sc-78343. Jan 61, 50p. 53 refs. Rept. no. 3, SRI Proj. 3192; AD-253 334.

DESCRIPTORS: *Data processing systems, Data storage systems, Military requirements, *Documentation, *Identification systems, Aerial photographs, *Military research, Video networks.

Photographic processing techniques and their equivalent electronic methods were investigated for the simplification of input data. Results are described for the following methods: (1) edge enhancement and tone simplification by the use of photographic semi-reversal effects, (2) edge enhancement and tone simplification by the xerographic process, and (3) optical techniques for the generation of outline images. Only the method using a defocused unity-gamma positive in register with the negative to make a compensated print, successfully retained all the information. A small pattern-recognition machine is being constructed capable of modification to various schemes of logic. The mathematical investigation of the application of certain theorems of integral geometry to the problem of pattern recognition is continued. A method for distinguishing between convex and non-convex figures is described, and an example of a method for finding the perimeter of a figure with an error lying between -2.26% and 1.15% from information derived by sampling in only six directions is given. Data storage and retrieval is being studied in relation to the special problems of non-alphanumeric graphical data processing. An account is given of the methods that were used for image coding for digital computer storage and processing, and some new methods are suggested. (Author) (See also PB 157 775)

PB 158 872 $11.50

University of Southern California [Los Angeles].
A SURVEY AND ANALYSIS OF CURRENT TEACHING-MACHINE PROGRAM AND PROGRAMMING, by Joseph W. Rigney and Edward B. Fry. Technical rept. no. 31 on Contract Nonr-228(22). Feb 61, 151p. 63 refs. AD-253 473.

DESCRIPTORS: *Reading machine, Learning, *Programming, *Training devices, Machines

This report is a survey of teaching-machine programs and programming techniques as they existed at the end of 1960. Originally, the intention was to sample literally every program in existence. It was soon recognized that this would be impossible. The programmed learning field is expanding so rapidly that an exhaustive sample is out of date by the time it can be published. However, 81 programs that are represented in the Appendix are believed to constitute over 75 per cent of the total number available. The object of the report is to present a cross-section of this field for the many individuals who have a need to know about programming and programs, but who are not working directly in the field. It is an interpretative and descriptive report rather than a survey of the research literature or of popular research issues. It describes the type of programs now available in terms of content and educational level. It defines common terms in the field, and summarizes programming rules and techniques. It presents an outline of factors which suggest the complexity of the educational context in which programmed learning must find a place; and, finally, it presents samples of 81 current programs. (Author)

MECHANICS

Aerodynamics and Pneumatics

PB 158 771 $1.60

Arnold Engineering Development Center [Arnold Air Force Station, Tenn.]
TOTAL HEAD PROFILES NEAR THE PLENUM AND TEST-SECTION SURFACES OF PERFORATED WALLS, by William L. Chew. Rept. on ARO, Inc. Contract AF 40(600)620. Dec 55, declassified 17 Feb 59, 13p. 3 refs. AEDC-TN-55-59; AD-81 567.

DESCRIPTORS: *Transonic wind tunnels, Walls, Pressure, Model tests, Wind tunnels

This report presents the results of the total pressure surveys made on four perforated walls at Mach numbers of 0.9 and 1.2. The tests were conducted in the Transonic Model Tunnel (TMT) of the Propulsion Wind Tunnel facility. (Author)

CEX-59.14 $1.75

Lovelace Foundation for Medical Education and Research, Albuquerque, N. Mex.
DETERMINATIONS OF AERODYNAMIC-DRAG PARAMETERS OF SMALL IRREGULAR OBJECTS BY MEANS OF DROP TESTS, by E. R. Fletcher, R. W. Albright and others. Oct 61, 76p.

PB 154 800 $1.60

Princeton U., N. J.
AERODYNAMICS OF FLAME STABILIZATION, by H. H. Chiu. Final technical rept. 15 Nov 55-30 Sep 60, on Contract DA 36-034-ORD-2183. 1 Oct 60, 13p. 8 refs. Aeronautical engineering rept. no. 522; OOR rept. 1545:4-E; AD-246 443.

DESCRIPTORS: *Flames, *Aerodynamics, Chemical reactions, Energy, Stabilization.

Experimentation and theoretical analysis were conducted to gain fundamental understanding of the initiation of a flame and its stabilization on a solid body. The flame is considered as a fully-developed region where energy is added to the flow medium through chemical reaction. The nature of the chemical reaction is unspecified - either the ordinary oxidation or the decomposition processes, or the atom or ion recombination processes. The intent is to confirm the belief that the fluid mechanics and the over-all chemical kinetics is equally important, and to achieve a mathematical formulation and physical explanation of the process of flame stabilization. A practical interest was derived from the development of the high output combustors of jet engines. Since the analytical problem was formulated in a general manner, involving mass diffusion, heat transfer and chemical reaction in a flow field, different parts of the analysis will bear on many other physical problems which may not appear to relate to the problem of flame stabilization in any manner. The scientific contents go beyond what may be recognized from the point of view of developing a better flameholder.

AD-258 033 $3.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
MASS ADDITION EFFECTS ON HYPERSONIC HEAT TRANSFER TO A TWO-DIMENSIONAL BODY, by Sinclaire M. Scala and William F. Ashley. 1 Dec 60, 35p. 20 refs. Technical Information Series R60SD491.

DESCRIPTORS: Blunt bodies, *Aerodynamic configurations, Aerodynamic heating, *Heat transfer, Hypersonic flow, Gas flow, Air, Gases, Mixtures, Shear stresses, Axially symmetric flow, Fluid flow, Transport properties, Thermodynamics, *Cylindrical bodies, Boundary layer, Laminar boundary layer, High altitude, Atmosphere, Theory, Mathematical analysis

As an extension of an earlier study of mass transfer effects at the axi-symmetric stagnation point, an exact solution has been obtained for the effects of mass transfer upon heat transfer and skin friction at the stagnation line of an infinite unyawed cylinder. The equations of change for the hypersonic laminar boundary layer flow were utilized. The fluid was treated as a binary mixture of chemically reacting gases, including "air atoms" and "air molecules". The transport and thermodynamic properties of the gas mixture were determined locally in the boundary layer as a function of the local temperature and gas composition. Numerical calculations were carried out on an IBM 704 digital computer. These results were used to obtain empirical equations for the heat transfer rate, the shear stress and the effects of mass transfer on heat transfer and shear stress. Finally, comparisons between the results obtained at the stagnation point of an axially-symmetric body and the stagnation line of a two-dimensional body have been made. (Author)

AD-258 034 $4.60

Space Sciences Lab., General Electric Co., Philadelphia, Pa.
SHOCK WAVE STRUCTURE IN A RELAXING DIATOMIC GAS, by L. Talbot (U. of California) and S. M. Scala. Nov 60, 47p. 12 refs. Technical Information Series R60SD850.

DESCRIPTORS: *Gas flow, *Shock waves, *Superaerodynamics, *Relaxation time, Gases, Molecules, Atoms, Particles, Thermodynamics, Perturbation theory.

A study is presented of the shock wave structure in a diatomic gas having a long relaxation time for one of its internal degrees of freedom. The Navier-Stokes equations and a subsidiary relaxation equation were assumed to apply. A perturbation technique based on a modified bulk viscosity approach was also investigated and compared with relaxation model. The effects of thermodynamic non-equilibrium within the shock wave were investigated by varying the number of collisions required for equilibration between the slow and fast degrees of freedom, over a range from zero to one hundred. Solutions for the shock wave structure are presented in phase space and in the spatial plane. The nominal thickness of the shock wave was calculated and results are given showing explicitly the effects of Mach number and collisions required for equilibration. It is concluded that the bulk viscosity model is inferior to the relaxation equation model in predicting the effects of a slow internal molecular degree of freedom in a gas. (Author)

AD-258 032 $1.60

Space Sciences Lab., General Electric Co. [Philadelphia, Pa.]
SHOCK WAVES IN A PLASMA, by K. T. Yen. June 61, 20p. 10 refs. Technical Information Series R61SD089.

DESCRIPTORS: *Shock waves, *Plasma physics, Gas flow, Gases, *Wave transmission, Ions, Magnetohydrodynamics, Dissociation, Kinetic theory, Ionization, Electrons, Diffusion.

Some of the recent analytical work on shock waves (normal) in a fully-ionized plasma are reviewed. Emphasis is on the physical nature of the problem, such as the speed of sound, shock structure, temperature equalization between the electrons and ions. Some special features of this problem and possible direction of further research are indicated. (Author)

METALLURGY

NYO-9583 $3.60

Aeroprojects, Inc., West Chester, Pa.
APPLICATIONS OF ULTRASONIC ENERGY. Task 2: ULTRASONIC METAL AND CERAMIC POWDER PROCESSING. TASK 3: ULTRASONIC INSTRUMENTATION. Progress rept. on Contract AT(30-1)-1836. June 61, 35p.

IS-221 $1.50

Ames Lab., Iowa State U. [of Science and Tech.]
ROLES OF NIOBIUM PENTOXIDE, VANADIUM PENTOXIDE AND TITANIUM DIOXIDE IN THE GRAIN GROWTH AND SINTERING OF URANIUM DIOXIDE, by James Frederick Watson and D. R. Wilder. May 60, 65p.

ANL-6289 $0.75

Argonne National Lab., Ill.
CASTING OF EBR-II-TYPE TRANSIENT TEST ELEMENTS AND EQUIPMENT DEVELOPMENT, by H. F. Jelinek and P. L. Dewez. Rept. on Contract W-31-109-eng-38. Sep 61, 33p.

NAA-SR-4515 $1.00

Atomics International, Canoga Park, Calif.
METALLURGICAL ASPECTS OF SRE FUEL ELEMENT DAMAGE EPISODE, by J. L. Ballif. Rept. on Contract AT(11-1)-GEN-8. Oct 61, 46p.

PB 158 736 $4.60

Battelle Memorial Inst., Columbus, Ohio.
THE EFFECT OF HYDROGEN ON THE MECHANICAL PROPERTIES OF TITANIUM-ALUMINUM ALLOYS, by L. W. Berger, D. N. Williams, and R. I. Jaffee. Summary rept. 1 May 56-30 Apr 57, on Contract DA 33-019-505-ORD-7. 30 Apr 57, 41p. 4 refs. WAL 401/79-34.

DESCRIPTORS: *Hydrogen, Metallurgy, *Titanium alloys, *Aluminum alloys, Alloys, Mechanical properties, Preparation, Microstructure, Tensile properties, Temperature.

The effects of hydrogen on the properties of binary Ti-Al alloys containing 2.5, 5, and 7 per cent aluminum and ternary alloys of the same compositions with the added interstitial elements oxygen, nitrogen, and carbon were studied. Increasing the aluminum content increases the apparent solubility of hydrogen in Ti-Al alloys, which accounts for the property trends determined. For unalloyed titanium and Ti-2.5Al, hydrogen additions up to 230-245 ppm have no detrimental effects on tensile properties. In both of these materials, however, notch-bend impact strength was seriously lowered by adding 75-80 ppm hydrogen, an addition which was sufficient to show hydride in the structure. In the Ti-5Al and Ti-7Al binary alloys, hydride did not appear in the microstructure until 315 and 415 ppm hydrogen, respectively, were added. This increased solubility of hydrogen resulted in considerable strengthening without loss in ductility as well as increased tolerance to impact embrittlement. Thermal exposure of all alloys for 1000 hours at 1000 F was not detrimental at the 2.5 and 5Al levels. Loss of tensile ductility after exposure was noted, however, for alloys containing 7 per cent aluminum.

BMI-1544 $0.75

Battelle Memorial Inst., Columbus, Ohio.
PROCESS DEVELOPMENT FOR MAKING SM-1 INSTRUMENTED FUEL PLATES BY GAS-PRESSURE BONDING, by Stan J. Paprocki, George W. Cunningham and others. Rept. on Contract W-7405-eng-92. Sep 61, 27p.

AD-257 041 $1.60

Compagnie Generale de T[élegraphie] S[ans] F[il] (France)
A PREPARATION AND STUDY OF COMPOUNDS OF THE II-IV TYPE AND MIXTURES THEREOF TO DETERMINE USEFUL SEMICONDUCTING PROPERTIES, by H. Guennoc. Final rept. on Contract AF 61(052)243. [1960] 15p.

DESCRIPTORS: *Semiconductors, *Magnesium compounds, Intermetallic compounds, Germanium alloys, Electrical properties, Zone melting, Thermal diffusion, Hall effect, Resistance, Thermoelectricity, Preparation, Physical properties, Stannides, Plumbides

To the mixtures $Mg_2 Sn_x Pb_{1-x}$, $Mg_2 Sn_x Ge_{1-x}$, which have been prepared so far, has been added the mixture $Mg_2 Pb_x Ge_{1-x}$. The synthesis of these mixtures was delayed through faults which arose in the oven working under a pressure of argon. Ensuring the homogeneity of the mixture always raises a delicate problem due to the ease of decomposition of the material. The solution to this problem will probably be found in the zone melting method. An attempt was made to determine the variation in thermal diffusivity of the $Mg_2 Sn_x Ge_{1-x}$ with its composition. It may be concluded from these results that thermal conductivity for the II-IV compounds can be substantially lowered by alloying several constituents. Search for impurities acting as donors or acceptors was continued, using monocrystals of $Mg_2 Sn$. Silver had already been found to be a p type impurity; antimony behaves as a n type impurity; the role of aluminum is not yet clearly seen.

PB 156 519 $3.60

Crucible Steel Co. of America, Syracuse, N. Y.
DEVELOPMENT OF A DUCTILE, OXIDATION-RESISTANT LOW-DENSITY ALLOY SYSTEM FOR INTERMEDIATE TEMPERATURE USE, by R. C. Gibson. Final rept. 15 Oct 59-15 Oct 60, on Contract NOas 60-6025-c. Jan 61, 35p. 1 ref. AD-252 817.

DESCRIPTORS: *Heat resistant alloys, Austenite, *Iron alloys, Aluminum alloys, Manganese alloys, Nickel alloys, Molybdenum alloys, Tungsten alloys, Vanadium alloys, Silicon alloys, Carbon alloys, Copper alloys, Boron alloys, Tensile properties, Heat treatment, Mechanical properties, Oxidation, Aging, Stresses, Rupture

The purpose of this program was to improve oxidation resistance and elevated temperature properties of the best alloy developed under the previous contract (NOas 58-848-c). As a result of this investigation, an alloy was developed containing about 7% Al, 33% Mn, 0.65% C, 3% Ni, 1% Mo, 0.50% W, 0.50% V, 0.50% Si, 0.008% B, and balance Fe, which possesses substantially better elevated temperature mechanical properties and oxidation resistance than the optimum alloy developed under the previous contract. (Author) (See also PB 144 134)

HW-33821(Del.) $1.60

Hanford Atomic Products Operation, Richland, Wash.
EVALUATION OF URANIUM-SILICON ALLOY, by M. A. Ryan. Rept. on Contract W-31-109-eng-52. Dec 54, 14p.

HW-68195 $1.50

Hanford Atomic Products Operation, Richland, Wash.
A STUDY OF THE WEAR AND GALLING OF AUTOCLAVED ZIRCALOY-2 BY VARIOUS MATERIALS, by J. W. Weber. Rept. on Contract AT(45-1)-1350. Jan 61, 54p.

KAPL-2162 $0.50

Knolls Atomic Power Lab., Schenectady, N. Y.
INVESTIGATIONS OF BINARY ZIRCONIUM ALLOYS, by A. E. Bibb, A. P. Beard, and D. L. Douglass. Rept. on Contract W-31-109-eng-52. Nov 60, 17p.

PB 158 780 $18.50

Lockheed Aircraft Corp. [Burbank] Calif.
ULTRA HIGH SPEED MACHINING. (FEASIBILITY STUDY) PHASE 1, by Robert L. Vaughn. Final technical engineering rept. 24 Feb 58-24 Aug 59, on Contract AF 33(600)36232. June 60, 294p. 202 refs. AMC Technical rept. 60-7-635(1); AD-239 908.

DESCRIPTORS: *Machining, Machine tools, *Explosive actuators, Cutting tools, Heat resistant alloys, Velocity, Steel.

Ultra high speed cutting of high strength steel alloys was shown to be feasible. Tool wear on heat treated (280 KSI Ftu) 4340 steel was minimum at a cutting speed of 120,000 surface feet per minute using SAE T-8 tool steel cutters. Experimental metal removal rates obtained were 240 times as great as with conventional cutting. However, applicability to production machining operations is yet to be demonstrated. Cutting tests were done with a 20mm smooth-bore gun barrel using specially designed single load breech and muzzle fixture. The muzzle fixture (extension of gun barrel) held a single point cutting tool in a tool holder with provisions for measuring cutting velocities, forces, temperatures, vibrations and chip formation. Cuts made in this manner were comparable to planer cuts. Test workpieces were projectiles of AISI 4340, AM 350, Inconel "X", 6Al-4V Titanium and 7075-T6 Aluminum propelled with standard 20mm hand loaded cartridges. By varying the type and weight of powder charge and the weight of the projectile it was possible to obtain any desired cutting speed from 15,000 to 240,000 surface feet per minute. Machinability data were obtained on 216 tests most of which used AISI 4340 steel workpieces. Annealed (120 KSI Ftu) 4340 was compared to heat treated (280 KSI Ftu) 4340 to establish the effect of heat treat condition on cutting speed. These results were used as a datum against which the other materials were tested and compared. (Author)

NYO-9187 $2.50

Nuclear Materials and Equipment Corp., Apollo, Pa.
CORROSION AND RADIATION DAMAGE RESISTANT FUEL MATERIAL (COATING OF URANIUM AND UO_2 PARTICLES). Final rept. 15 Nov 59-14 Nov 60, on Contract AT(30-1)-2264. Sep 61, 136p.

PB 156 132-1 $9.60

Reactive Metals, Inc., Niles, Ohio.
MANUFACTURE OF HEAT TREATABLE Ti-6A1-4V AND Ti-2. 5A1-16V SHEETS, by P. E. Moorhead, S. R. Seagle, and O. Bertea. Final rept. Part A, 6 Aug 56-31 July 60, on Contract NOa(s) 56-994-c. July 1960. 114p. AD-243 521.

DESCRIPTORS: *Titanium alloys, Aluminum alloys, Vanadium alloys, *Sheets, Production, Manufacturing methods, Rolling mills, Processing, Heat treatment, Alloys.

A satisfactory process was developed for producing Ti-2. 5A1-16V sheets. The alloy was amenable to solution treatment since the initial transformation of β to α occurs after 1 min. Thus, air cooling from the solution temperature is possible. In order to obtain reproducible results in age hardened sheets, the time for heating to the aging temperature must be standardized. Also excellent temperature control ($\pm 5^{o}$ F) should be maintained at the aging temperature. The Ti-25 A1-16V alloy had a high tolerance for hydrogen; it was less weldable than Ti-6A1-4V.

SEP-96(Del.) $3.60

Sylvania Electric Products, Inc., Bayside, N. Y.
THE POWDER METALLURGY OF ZIRCONIUM-URANIUM ALLOYS. PART I, by Herbert S. Kalish and Henry H. Hausner. July 52, 39p.

PB 181 067 $0.50

Williams, Clyde, and Co., Columbus, Ohio.
EXPLOSIVE METALWORKING. ITS APPLICATIONS STATUS, by Robert E. Greenlee and William H. Bickley. Rept. on Contract CC 4569. [1961] 18p. 28 refs.

DESCRIPTORS: *Metals, *Explosive forming, *Explosives, Metallurgy, Dies.

Structural Metallurgy and Corrosion

KAPL-2155 $1.50

Knolls Atomic Power Lab., Schenectady, N. Y.
A DISCUSSION OF THE SUSCEPTIBILITY OF AISI 410 TO STRESS CORROSION, AND MEANS OF ELIMINATING THE STRESS-CORROSION PROBLEM, by Henry Suss. Rept. on Contract W-31-109-eng-52. Mar 61, 73p.

PB 155 130 $2.60

Springfield Armory, Mass.
AN INVESTIGATION OF ULTRASONIC INSPECTION METHODS FOR SINTERED POWDERED METAL COMPACTS, by R. D. Korytoski and E. H. Abbe. Rept. on Nondestructive Testing Methods for the Inspection of Small Arms Weapons. 3 Oct 60, 29p. 4 refs. Rept. no. SA-TR19-1217; AD-252 184.

DESCRIPTORS: Powder metallurgy, *Non-destructive testing, Powder alloys, Metals, Powders, Sintered alloys, Sintered iron, *Ultrasonics, Pulse generators, Quality control, Test methods, Tests, Small arms

Progress is reported on a continuing study to determine the feasibility of utilizing ultrasonic attenuation methods in nondestructive inspection of cast and sintered small arms components. Studies are summarized concerning techniques and equipment designed and developed for ultrasonic measurement of cast, sintered, and wrought ferrous material. Influence of variables such as density, grain size, surface preparation, filler substances, degree of sintering, and specimen geometry on ultrasonic attenuation is discussed. (Author)

NUCLEAR PHYSICS AND NUCLEAR CHEMISTRY

PB 158 773 $6.60

Air Force Inst. of Tech., Wright-Patterson AFB, Ohio.
NUCLEAR REACTOR SIMULATOR, by Daren Lane Lucke. Master's thesis. Mar 60, 68p. 4 refs. GNE-60-11; AD-236 713.

DESCRIPTORS: *Test reactors, Simulation, Design, *Electronic equipment, *Analog computers, Differential equations, Reactor power density, Determination.

This simulator is an electronic device used in conjunction with an analog computer that solves the differential equations used to describe a reactor system. The simulator has the ability to operate with any desired value for each of the reactor parameters. The simulator can be operated with either a positive, negative, or zero temperature coefficient of reactivity. The period, log n, and xenon poisoning is also included in the simulator. The control panel used for the simulator is similar to that found in actual reactors. A method of setting various reactor parameters and operating procedures for the simulator are also included. (Author)

BNL-686(T-233) $1.00

Brookhaven National Lab., Upton, N. Y.
RADIATION INDUCED EFFECTS IN MAGNESIUM OXIDE CATALYSTS, by J. Hoigne and D. Ballantine. Apr 61, 41p.

NAS-NS-3043 $0.50

Buffalo U., N. Y.
THE RADIOCHEMISTRY OF GERMANIUM, by Jacob A. Marinsky. July 61, 54p.

CEND-137 $1.25

Combustion Engineering, Inc., Windsor, Conn.
A SURVEY OF THE BEGINNING OF LIFE CHARACTERISTICS OF URANIUM-FUELED, WATER-MODERATED LATTICES, by J. Bengston and R. L. Hellens. Study of slightly-enriched uranium-water lattices with high conversion ratio. Rept. on Contract AT(30-1)-2379. July 61, 56p.

SRO-52 $0.75

Florida State U., Tallahassee.
RADIOCHEMISTRY OF ANTIMONY AND BISMUTH, by Harold C. Beard. Final rept. on Contract AT(38-1)-223. Aug 61, 31p.

GA-2113 $2.75

General Atomic Div., General Dynamic Corp., San Diego, Calif.
ENERGY-DEPENDENT AND SPECTRUM-AVERAGED THERMAL CROSS SECTIONS FOR THE HEAVY ELEMENTS AND FISSION PRODUCTS FOR VARIOUS TEMPERATURES AND C:U^{235} ATOM RATIOS, by N. F. Wikner and S. Jaye. Rept. on Contract AT(04-3)-314. June 61, 150p.

GA-2156 $2.00

General Atomic Div., General Dynamics Corp., San Diego, Calif.
LEGENDRE EXPANSION COEFFICIENTS FOR THE ANGULAR DISTRIBUTION OF ELASTICALLY-SCATTERED NEUTRONS AND FAST-NEUTRON CROSS SECTIONS FOR DEUTERIUM, BERYLLIUM, CARBON, OXYGEN, ZIRCONIUM, LEAD, AND BISMUTH, by G. D. Joanou, A. J. Goodjohn and N. F. Wikner. Rept. on Contract AT(04-3)-314. May 61, 80p.

PB 158 646 $11.00

General Motors Corp., Detroit, Mich.
INVESTIGATIONS ON THE DIRECT CONVERSION OF NUCLEAR FISSION ENERGY TO ELECTRICAL ENERGY IN PLASMA DIODE. Final rept. on Contract Nonr-3109(00). 31 Dec 60, 144p. 33 refs. AD-250 673.

DESCRIPTORS: *Nuclear energy, *Fission, Fission products, *Plasma physics, *Diodes, Electrons, Energy, *Electric power production, Cathodes, *Cesium electron tubes, Cesium

Experimental and theoretical studies were carried out on the fission fragment, noble gas plasma diode for direct conversion of nuclear energy to electrical energy. Electron emissivity was measured in connection with material research on uranium bearing cathodes. Spectral measurements of cesium plasmas were carried out yielding data on electron temperatures and ion number densities. Preliminary measurements were made on a pulsed noble gas plasma diode.

SRO-55 $1.75

Georgia Inst. of Tech. Engineering Experiment Station, Atlanta.
AN INVESTIGATION OF THE USE OF RADIOACTIVE ISOTOPES FOR DETERMINING THE SURFACE AREA OF POWDERED MATERIALS BY SORPTION METHODS, by Margaret C. Kordecki and Miriam B. Gandy. Rept. on Contract AT(38-1)-202. Apr 61, 69p.

UCRL-9679 $1.00

Lawrence Radiation Lab., U. of California, Berkeley.
CLEBSCH-GORDAN COEFFICIENTS FOR NUCLEAR TRANSITION PROBABILITIES: I ODD-MASS NUCLIDES, by Jacqueline K. Lum, James H. Light, and Frank Asaro. Rept. on Contract W-7405-eng-48. Aug 61, 39p.

PB 158 741 $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
QUANTITATIVE DISTILLATION OF FISSION RUTHENIUM, by L. Wish. 8 July 60, 12p. 6 refs. Research and development technical rept. USNRDL-TR-441; AD-243 804.

DESCRIPTORS: *Ruthenium compounds, *Fission product activity, *Fission products, Neutron activation, Separation, Oxidation.

The procedure for the distillation of fission ruthenium as the tetroxide was modified to give a quantitative recovery without the use of ruthenium carrier. Four samples were analyzed for ruthenium with a precision of 2%. The activity of three of the samples agreed to 1%, but the fourth showed a 10% difference which was ascribed to the physical conditions of the neutron irradiation of the uranium-235. The residue from the distillation could then be readily used for further fission product separations. (Author)

NAS-NS-3041 $1.00

Oak Ridge National Lab., Tenn.
THE RADIOCHEMISTRY OF COBALT, by L. C. Bate and G. W. Leddicotte. Sep 61, 95p.

NAS-NS-3042 $0.50

Oak Ridge National Lab., Tenn.
THE RADIOCHEMISTRY OF TUNGSTEN, by W. T. Mullins and G. W. Leddicotte. Sep 61, 45p.

NYO-2481 $1.00

Radiation Applications, Inc., Long Island City, N. Y.
A STUDY OF THE MECHANISM OF RADIATION-INDUCED GELATION IN MONOMER-POLYMER MIXTURES, by George Odian, Bruce S. Bernstein and others. Rept. on Contract AT(30-1)-2554. July 61, 33p.

Instruments and Installations

BNL-683(T-230) $2.25

Brookhaven National Lab., Upton, N. Y.
CATALOGUE OF HIGH ENERGY ACCELERATORS, comp. by Mark Q. Barton. Sep 61, 104p.

UCRL-9765 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
AN ALPHA AIR PROPORTIONAL HAND AND FOOT COUNTER, by William J. Roach and Robert J. Walker. Rept. on Contract W-7405-eng-48. July 61, 9p.

UCRL-9721 $0.50

Lawrence Radiation Lab., U. of California, Berkeley.
BEVATRON OPERATION AND DEVELOPMENT. XXIX, by Walter D. Hartsough. Rept. Feb-Apr 61, on Contract W-7405-eng-48. June 61, 11p.

UCRL-9789 $0.50

Lawrence Radiation Lab., U. of California, Berkeley
RESPONSE OF THE OAK RIDGE CRITICALITY FISSION FOIL MONITOR, by Bob Wayland. Rept. on Contract W-7405-eng-48. July 61, 18p.

UCRL-6425 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
A SIMPLE HIGH-LEVEL ALPHA AIR MONITOR, by C. L. Lindeken, E. L. Beard, and O. M. Barlow. Rept. on Contract W-7405-eng-48. June 61, 16p.

SCDR-27-61 $0.50

Sandia Corp., Livermore, Calif.
QUANTITIVE DETERMINATION OF RESIDUAL LEAK-DETECTION TRACER GAS USING A STANDARD LEAK DETECTOR, by J. P. Darginis. July 61, 11p.

UCRL-13009 $3.60

Solid State Radiations, Inc., Los Angeles, Calif. and Lawrence Radiation Lab., U. of California, Livermore.
FAST NEUTRON DETECTION FOR TIME OF FLIGHT SPECTROMETRY. Final rept. May 61, 39p.

Nuclear Engineering and Power

ACNP-6102 $2.75

Allis-Chalmers Manufacturing Co., Milwaukee, Wis.
PATHFINDER ATOMIC POWER PLANT. Technical progress rept. Oct 60-Dec 60, on Contract AT(11-1)-589. Apr 61, 159p.

ANL-6406 $0.75

Argonne National Lab., Ill.
CALCULATIONS FOR ZPR-VII FLUX-TRAP REACTORS WITH HEAVY WATER-MODERATED CORES, by E. M. Pennington. Rept. on Contract W-31-109-eng-38. Aug 61, 31p.

ANL-6299 $2.00

Argonne National Lab., Ill.
EBR-II DRY CRITICAL EXPERIMENTS. Experimental program, Experimental procedures, and Safety considerations, by L. J. Koch, W. B. Loewenstein and others. Rept. on Contract W-31-109-eng-38. Feb 61, 87p.

NAA-SR-5925 $1.00

Atomics International, Canoga Park, Calif.
MOLTEN PHOSPHATE REACTOR FUEL, I, by W. S. Ginell. Rept. on Contract AT(11-1)-GEN-8. Sep 61, 40p.

NAA-SR-6100(Vols. 1 & 2) $3.00

Atomics International, Canoga Park, Calif.
STEAM-COOLED POWER REACTOR EVALUATION, GRAPHITE-MODERATED, BOILING WATER, STEAM-SUPERHEAT REACTOR. Rept. on Contract AT(11-1)-GEN-8. Sep 61, 227p.

BMI-1548 $2.00

Battelle Memorial Inst., Columbus, Ohio.
A METHOD FOR THE STUDY AND CORRELATION OF FISSION-GAS-RELEASE BEHAVIOR OF FUEL MATERIALS DURING IRRADIATION, by Gilbert E. Raines, Charles W. Townley and others. Rept. on Contract W-7405-eng-92. Oct 61, 88p.

BMI-1534(Del.) $2.00

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING JULY, 1961, by Russell W. Dayton and Clyde R. Tipton, Jr. Rept. on Contract W-7405-eng-92. Aug 61, 77p.

BMI-1524(Del.) $2.25

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING JUNE, 1961, by Russell W. Dayton and Clyde R. Tipton, Jr. Rept. on Contract W-7405-eng-92. July 61, 94p.

BMI-1050(Del.) $7.60

Battelle Memorial Inst., Columbus, Ohio.
PROGRESS RELATING TO CIVILIAN APPLICATIONS DURING OCTOBER, 1955, by Russell W. Dayton and Clyde R. Tipton, Jr. Rept. on Contract W-7405-eng-92. Nov 55, 80p.

GNEC-172 $2.50

Combustion Engineering, Inc., Windsor, Conn. and General Nuclear Engineering Corp., Dunedin, Fla.
NUCLEAR SUPERHEAT DEVELOPMENT PROGRAM. Quarterly progress rept. no. 7, Jan-Mar 61, on Contract AT(11-1)-795. Aug 61, 133p.

TID-13675 $7.60

Duquesne Light Co., Shippingport, Pa.
MONTHLY OPERATING REPORT. Volume IV, Issue 8. Rept. on Contract AT(11-1)-292. Aug 61, 79p.

GA-1854 $1.75

General Atomic Div., Genaral Dynamics Corp., San Diego, Calif.
DEVELOPMENT OF METAL-CLAD FUEL ELEMENTS FOR THE HIGH-TEMPERATURE GAS-COOLED REACTOR, by W. P. Wallace, D. W. Ver Planck and others. Rept. on Contract AT(04-3)-314. Mar 61, 74p.

GEAP-3737 $1.25

General Electric Co., San Jose, Calif.
FLOOD SAFETY OF THE MIXED SPECTRUM SUPERHEATER, by A. B. Reynolds. Rept. on Contract AT(04-3)-189. May 61, 46p.

GEAP-3709 $1.50

General Electric Co., San Jose, Calif.
FUEL CYCLE PROGRAM. A BOILING WATER REACTOR RESEARCH AND DEVELOPMENT PROGRAM. Quarterly rept. no. 3, Jan-Mar 61, on Contract AT(04-3)-189. Sep 61, 63p.

GEAP-3397(Rev. 1) $2.00

General Electric Co., San Jose, Calif.
NATURAL CIRCULATION LOOP PERFORMANCE AT 1000 PSIA UNDER PERIODIC ACCELERATIONS, by E. P. Quinn and J. M. Case. Rept. on Contract AT(04-3)-189. May 60, 80p.

GEAP-3633 $3.00

General Electric Co., San Jose, Calif.
STEAM-COOLED POWER REACTOR EVALUATION STUDY OF 300 MW(e) ONCE-THROUGH SUPERHEATER REACTOR. Rept. on Contract AT(04-3)-189 Jan 61, 221p.

HW-67473 $2.75

Hanford Works, General Electric Co., Richland, Wash.
STEAM COOLED POWER REACTOR EVALUATION - BELOYARSK (URAL) REACTOR. Apr 61, 148p.

UCRL-5882(Rev.) $0.75

Lawrence Radiation Lab., U. of California, Livermore.
CHEMICAL REACTIONS INDUCED BY UNDERGROUND NUCLEAR EXPLOSIONS, by G. H. Higgins, D. E. Rawson and W. Z. Wade. Rept. on Contract W-7405-eng-48. June 61, 32p.

UCRL-6578 $1.75

Lawrence Radiation Lab., U. of California, Livermore.
ON CRATERING. A BRIEF HISTORY, ANALYSIS AND THEORY OF CRATERING, by Milo D. Nordyke. Rept. on Contract W-7405-eng-48. Aug 61, 78p.

UCRL-6504 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
PRELIMINARY RESULTS OF HIGH-TEMPERATURE BARE U^{235} -C CRITICAL ASSEMBLY MEASUREMENTS, by Reinald G. Finke. Rept. on Contract W-7405-eng-48. June 61, 9p.

LAMS-2623 $0.50

Los Alamos Scientific Lab., N. Mex.
ULTRA HIGH TEMPERATURE REACTOR EXPERIMENT (UHTREX). Quarterly status report for period ending 20 Aug 61 on Contract W-7405-eng-36. Oct 61, 20p.

MND-M-1857 $2.25

Martin Co., Baltimore, Md.
PM-1 TASK 5, SUBTASK 5.8. LOCAL BOILING HEAT TRANSFER TESTS, by S. Frank, J. Jicha and M. Norin. May 61, 113p.

ORNL-3167 $2.50

Oak Ridge National Lab., Tenn.
HOMOGENEOUS REACTOR PROGRAM. Progress rept. 1 Dec 60-31 May 61, on Contract W-7405-eng-26 131p.

ORNL-3069 $1.00

Oak Ridge National Lab., Tenn.
MEASUREMENTS AT BEAM HOLE HB-2 OF THE OAK RIDGE RESEARCH REACTOR FOR SOUTH FACILITY MOVABLE SHIELD DESIGN STUDY, by F. J. Muckenthaler, T. V. Blosser and others. Rept. on Contract W-7405-eng-26. [1961] 37p.

ORNL-3178 $1.25

Oak Ridge National Lab., Tenn.
LID TANK SHIELDING FACILITY MEASUREMENTS BEHIND THE ML-1 MOCKUP, by A. D. MacKellar, L. Jung and others. Rept. on Contract W-7405-eng-26. [1961] 50p.

TID-3092 $1.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
NUCLEAR EXPLOSION EFFECTS ON STRUCTURES AND PROTECTIVE CONSTRUCTION, comp. by John H. Mitchell. A selected bibliography. Apr 61, 62p.

SC-4483(RR) $2.50

Sandia Corp., Albuquerque, N. Mex.
HIGH-EXPLOSIVE DITCHING FROM LINEAR CHARGES, by R. H. Carlson. Project Toboggan. July 61, 125p.

SL-1873 $4.00

Sargent and Lundy, Chicago, Ill.
ENGINEERING EVALUATION STUDIES - HEAVY WATER MODERATED POWER REACTOR PLANTS, by W. A. Chittenden and G. F. Hoveke. Rept. on Contract AT(38-1)-213. June 61, 343p.

TID-3522(5th Rev.) $0.50

Office of Technical Information, Atomic Energy Commission, Washington, D. C.
PEACEFUL USES OF NUCLEAR EXPLOSIONS. A literature search, comp. by Hugh E. Voress. Oct 61, 18p.

NDA-2131-38 $1.75

United Nuclear Corp., White Plains, N. Y.
A METHOD FOR CALCULATING THE REACTIVITY OF D_2O-MODERATED NATURAL URANIUM LATTICES WITH CLUSTERED ROD FUEL ELEMENTS, by H. Soodak and R. Sullivan. Rept. on Contract AT(30-1)-2303(IX). June 61, 66p.

GEAP-3398 $4.00

Vallecitos Atomic Lab., Pleasanton, Calif.
DESIGN SUMMARY REPORT FOR THE GETR-HELIUM LOOP-1, by R. F. Hausman. Technical rept. on Contract W-7405-eng-26. June 60, 319p.

Radioactivity

TID-12994 $4.60

New York U., N. Y.
THE MEASUREMENT OF ENVIRONMENTAL RADIATION. Annual rept. on Contract AT(30-1)-1704. June 61, 49p.

ORNL-3180 $0.50

Oak Ridge National Lab., Tenn.
CERENKOV RADIATION INTENSITY CALCULATIONS FOR Sr^{90} AND Co^{60} IN WATER, by R. G. Wymer and R. E. Biggers. Rept. on Contract W-7405-eng-26. [1961] 18p.

ORNL-3181 $1.50

Oak Ridge National Lab., Tenn.
ECOLOGICAL SAMPLING AND METEOROLOGICAL CALCULATION OF FALLOUT ON FORESTS NEAR OAK RIDGE, by J. S. Olson. Rept. on Contract W-7405-eng-26. [1961] 59p.

ORNL-3152 $2.50

Oak Ridge National Lab., Tenn.
RADIOACTIVITY OF NUCLEAR REACTOR COOLING FLUIDS, by J. C. Ward. Rept. on Contract W-7405-eng-26. [1961] 118p.

Waste Disposal

ORNL-2986 $1.25

Oak Ridge National Lab., Tenn.
LABORATORY DEVELOPMENT OF A POT CALCINATION PROCESS FOR CONVERTING LIQUID WASTES TO SOLIDS, by H. W. Godbee and J. T. Roberts. Rept. on Contract W-7405-eng-26. [1961] 48p.

ORNL-3053 $2.25

Oak Ridge National Lab., Tenn.
STATUS REPORT ON WASTE DISPOSAL IN NATURAL SALT FORMATIONS: III, by F. M. Empson. Rept. on Contract W-7405-eng-26. [1961] 97p.

TID-7621 $3.00

Sanitary Engineering Research Lab., U. of California, Berkeley.
GROUND DISPOSAL OF RADIOACTIVE WASTES, comp. and ed. by Warren J. Kaufmann. Conference proceedings, Berkeley, California, 25-27 Aug 59. Rept. on Contract AT(11-1)-34. July 61, 172p.

PERSONNEL SUPPLIES AND PERSONAL EQUIPMENT

PB 158 737 $3.60

Naval Supply Research and Development Facility, Bayonne, N. J.
DEVELOPMENT AND EVALUATION OF AN EXPERIMENTAL IMPERMEABLE GENERAL PURPOSE ABCW DECONTAMINATION SUIT, by Seymour Lash and Edward Cherowbrier. Rept. on ABC Warfare Protective Clothing for Naval Forces. [1958] 34p. Clothing and Textile Division rept. no. 38.

DESCRIPTORS: Naval personnel, *Protective clothing, Design, Tests, *Radiological warfare agents, *Biological warfare agents, *Chemical warfare agents, Countermeasures, Contamination, Decontamination, Gas masks, Personnel.

One piece impermeable coveralls with attached and detached Navy MK V gas masks were developed for

ABCW decontamination operations under cool to moderately warm conditions. These garments were subjected to laboratory studies and evaluations conducted by the Naval Supply Research and Development Facility, various ABCW schools, and Army Chemical Corps activities. These studies indicated that the suit with detached gas mask provides adequate protection against toxicological agents and is more suited to the Navy's needs than the garment with attached mask or the standard M-3 impermeable suit. (Author)

PHYSICS

ANL-4983(Del.) $2.60

Argonne National Lab., Lemont, Ill.
SUPPLEMENT TO THE SUMMARY REPORT JUNE THROUGH NOVEMBER 1952, by Louis A. Turner. Rept. on Contract W-31-109-eng-38. Mar 53, 28p.

AD-258 531 repriced $1.75

Carbon Research Lab., U. of Buffalo, N. Y.
INVESTIGATION OF ELASTIC AND THERMAL PROPERTIES OF CARBON-BASE BODIES, by S. Mrozowski, J. F. Andrew and others. Rept. for July 59-Oct 60 on Ceramic and Cermet Materials, Contract AF 33(616)5186. Feb 61, 64p. 9 refs. WADC Technical rept. 58-360, Part 3.

DESCRIPTORS: *Graphite compounds, *Carbon compounds, Thermodynamics, Elasticity, Thermal conductivity, Thermal diffusion, Deformation, High temperature research, Heat treatment, Physical properties, Temperature, Tests, Measurement, Ceramic materials.

Elastic properties and permanent set were investigated at room temperature for carbons made of graphitized filler (soft and hard) and for carbons impregnated in the baked or graphitized state in dependence on the heat-treatment temperature. An apparatus for study of deformation at high temperatures (1000 - 3000 C) was built and calibrated. Results for the variation of Young's modulus with ambient temperature were reported. Another improved apparatus for studies of heat conductivity at high temperatures was finished and also put into operation. Studies of corrections to the heat conductivity due to convection by gas across the pores were made and it is shown that such corrections are necessary even in the case of quite dense carbons. Transverse heat diffusivity was investigated in the range 700 - 2800 C by a transient state method, using a newly constructed apparatus good fit with previously found data in the low temperature range is obtained. A general discussion of the aims of the project is included. (Author)

PB 158 821 $1.60

Cruft Lab., Harvard U., Cambridge, Mass.
SHIELDING BY A THIN CONDUCTING SHEET AGAINST TRANSIENT ELECTROMAGNETIC SIGNALS, by N. R. Zitron. Technical rept. on Contract Nonr-1866(26). 10 Aug 59, 13p. 8 refs. Technical rept. no. 311; DASA-1165; AD-235 694.

DESCRIPTORS: *Electromagnetic shielding, *Mathematical analysis, Electrical equipment, Integral transforms.

The shielding effect of a thin, horizontal imperfectly conducting sheet against the transient field of a vertical magnetic dipole when excited by a ramp function is investigated. The results are calculated by taking Laplace transforms of the frequency spectrum functions for the steady-state problem. The response to the ramp function is calculated and the significance of the results in shielding against surges is discussed. (Author)

UCRL-9704 $2.00

Lawrence Radiation Lab., U. of California, Berkeley.
PHYSICS DIVISION SEMIANNUAL REPORT, Nov 60-Apr 61. Rept. on Contract W-7405-eng-48. May 61, 83p.

UCRL-6583 $0.50

Lawrence Radiation Lab., U. of California, Livermore.
ON THE DIFFUSION OF MAGNETIC FIELD INTO A CONDUCTING GAS IN WHICH INERTIAL FORCES ARE NEGLECTED, by R. E. Kidder. Aug 61, 28p.

UCRL-6131 $0.75

Lawrence Radiation Lab., U. of California, Livermore.
TRAPPING AND CONFINEMENT OF 20-kev HYDROGEN ATOMS IN A MAGNETIC MIRROR MACHINE, by James F. Steinhaus and Charles C. Damm. Rept. on Contract W-7405-eng-48. Dec 60, 32p.

PB 156 248 $3.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
A REVIEW OF MAGNETOHYDRODYNAMICS, by Rolf K. M. Landshoff. 15 Apr 59, 33p. 67 refs. LMSD-49702.

DESCRIPTORS: *Magnetohydrodynamics, Stability, Fluid flow, Shock waves, Turbulence, Electrical conductance, Fluid mechanics, Mathematical analysis, Partial differential equations, Hydrodynamics.

LAMS-2596 $0.50

Los Alamos Scientific Lab., N. Mex.
IONIZATION OF THE INTERPLANETARY GAS, by George B. Arfken, Jr. Rept. on Contract W-7405-eng-36. Oct 61, 64p.

LAMS-2609 $1.25

Los Alamos Scientific Lab., N. Mex.
PROPOSAL FOR A 3.5-MEGAJOULE MAGNETIC COMPRESSION EXPERIMENT, SCYLLA IV, by E. L. Kemp, T. M. Putnam and others. Rept. on Contract W-7405-eng-36. Oct 61, 47p.

PB 158 740 $1.60

Naval Radiological Defense Lab., San Francisco, Calif.
MEASUREMENT ERROR FROM ENERGY DEPENDENCE OF UNSATURATED CURRENT IONIZATION CHAMBERS, by A. H. Redmond. 30 Sep 60, 18p. 1 ref. Research and development technical rept. USNRDL-TR-464; AD-246 585.

DESCRIPTORS: *Ionization chambers, Gamma rays, *Photons, Energy, Sensitivity, Measurement, Errors, *Intensity.

The consequences are discussed of having an ionization chamber response that is not constant under equal intensities of gamma photons of different energies. In particular the question is considered whether the occurrence of energy sensitivity of this kind would lead to error in response from monochromatic photons bombarding the chamber at different fluxes. Three cases are discussed: (1) an unsaturated chamber having a parabolic response; (2) the linear, or saturated, chamber; and (3) an unsaturated chamber having a logarithmic response to gamma intensity. The analysis shows that no rate sensitivity arises from energy sensitivity with unsaturated and saturated chambers, but that rate sensitivity with the logarithmic chamber results from energy sensitivity to monochromatic photons at low intensities, but progressively decreases at higher intensities. The discussion refers to photons of single energies. For a mixture of energies the effects must be summed over the whole range of energies for which the chamber will be used, and may lead to a large error. (Author)

ORNL-3170 $0.75

Oak Ridge National Lab., Tenn.
ELECTROSTATIC ION-CYCLOTRON PLASMA INSTABILITIES IN A TWO-FLUID HYDRODYNAMIC THEORY, by Hermann K. Wimmel. Rept. on Contract W-7405-eng-26. [1961] 30p.

ORNL-3161 $0.75

Oak Ridge National Lab., Tenn.
ENERGY DISTRIBUTION OF IONS AND ELECTRONS IN DCX AFTER BURNOUT: ORACLE CODE EDDIE, by T. K. Fowler and M. Rankin. Rept. on Contract W-7405-eng-26. [1961] 32p.

MATT-67 $2.25

Plasma Physics Lab., Princeton U., N. J.
THE EFFECT OF STRONG MAGNETIC FIELD ON CHEMICAL ENGINEERING SYSTEMS, by F. W. Camp and E. F. Johnson. Rept. on Contract AT(30-1)-1238. Mar 61, 99p.

WT-1472 $1.75

Sandia Corp., Albuquerque, N. Mex.
EFFECTS OF A PRECURSOR SHOCK WAVE ON BLAST LOADING OF A STRUCTURE, by J. R. Banister and L. J. Vortman. Operation Plumbbob. Aug 61, 76p.

PB 158 129 $1.10

Timber Engineering Co., Washington, D. C.
STRAIN PATTERNS IN CURVED AND STRAIGHT LAMINATED BEAMS SUBJECTED TO STATIC BENDING STRESS, by W. J. Finnorn and R. A. Holcombe. Rept. on Contract NObs-77018. 28 Oct 59, 10p. AD-231 662.

DESCRIPTORS: *Beams, Laminates, Wood, Deflection, Stresses, Photographic analysis, Light, Reflection, Measurement.

Strain observations were made on 4 laminated beams, each composed of 11 laminations and with a 6-by 6-in. cross section, while being centrally loaded over a 66-in. span. Two of the beams were of Douglas fir and 2 of white oak. One beam of each species was straight and one of each had a 72-in. inside radius of curvature. The color changes of polarized light reflected through clear plastic sheets attached at 3 locations on the beam by a reflective cement were observed while the beams were progressively loaded. Color photographs of strain patterns were made at loadings of 4000 and 8000 lbs and at several loads over 8000 pounds. A non-uniform gradation of strain occurred throughout the depth of the beam, varying appreciable from lamination to lamination. The simpler strain patterns were observed at stations between the center and end supports on both curved and straight beams. Maximum strain, parallel to the axes of both curved and straight beam, appeared in the top 2 laminations. Strain at 45° to the axis appeared to be maximum in the 3 bottom laminations of the curved beams, and in laminations 5 through 8 in the straight beams.

Acoustics

PB 158 743 $1.10

Lessells and Associates, Inc., Boston, Mass.
ACOUSTIC EMISSION UNDER APPLIED STRESS. Progress rept. no. 7, 15 Oct 59-15 Jan 60, on Contract AF 33(616)5640. [1960] 10p. AD-232 172.

DESCRIPTORS: *Metals, *Acoustics, *Stresses, Wave transmission, Transducers.

The purpose of this research is to determine the source and basic mechanisms producing acoustic pulses generated within metals subjected to elastic and plastic deformation.

PB 158 744 $1.10

Lessells and Associates, Inc., Boston, Mass.
ACOUSTIC EMISSION UNDER APPLIED STRESS. Progress rept. no. 8, 15 Jan-15 Apr 60, on Contract AF 33(616)5640. [1960] 8p. AD-235 448.

DESCRIPTORS: *Metals, *Acoustics, *Stresses, Wave transmission, Transducers, Metallic crystals, Single crystals, Zinc, Aluminum

Tests were continued on the zinc and aluminum single crystals. Strain was successfully recorded simultaneously with the occurrence of the acoustic emission and load data. The stress-strain behavior data is

being processed in relation to the acoustic emission. The strain information is connected with the deformation mechanics taking place within the specimen. The strain recording has the capacity to show erratic or discontinuous behavior, variation in the rate of strain, degree of strain, and relative amounts of elastic and plastic strain. Existence of these peculiarities is expected to show correlation with the acoustic emission behavior if the mechanisms are essentially at the same level of resolution, but in any case will provide insight into this area. (Author) (See also PB 158 743)

PB 158 745 $1.60

Lessells and Associates, Inc., Boston, Mass.
ACOUSTIC EMISSION UNDER APPLIED STRESS, by B. H. Schofield. Progress rept. no. 10, 15 July-15 Oct 60, on Contract AF 33(616)5640. [1960] 14p. AD-248 500.

DESCRIPTORS: *Acoustics, Wave transmission, *Stresses, *Metals, Deformation

The source and originating mechanism of the acoustic pulses emitted from Zn and Al specimens are being investigated. An analysis was made to determine the characteristics of emission relative to the stress and strain on the specimen. Acoustic pulses versus time data were tabulated, and the number of events per unit time or acoustic pulses per unit time versus time was obtained. The events per unit time data showed the erratic, discontinuous nature of the emission rate, especially at the low stress levels. The data showed a distinct relationship between the acoustic emission and the deformation behavior of the specimens. For aluminum and zinc single crystals, both the acoustic emission rate and strain values were very similar. In the first stage, the strain is essentially elastic, hence the emission rate is low; it is not absolutely zero, indicating the existence of submicroscope plastic strain even in the so-called plastic region. More salient evidence of plastic deformation is present in the second and third stages; dislocation is prominent in these regions. Values of the size of the displacements per unit signal were computed for the different specimens. Displacements of 75 x 10 to the -8th power to 100 x 10 to the -8th power cm/signal were computed for the Zn specimen; for Al the value was computed as 50 x 10 to the -8th cm/signal. (See also PB 158 744)

Electricity and Magnetism

PB 158 746 $13.00

General Electric Co. [Schenectady, N. Y.]
THERMOELECTRIC CONVERSION OF ENERGY. Final rept. 1 Oct 58-30 Sep 59, on Contract AD 44-177-tc-525. 23 Oct 59, 190p. 26 refs. AD-234 537.

DESCRIPTORS: *Thermoelectricity, *Materials, Temperature, Energy, Mobile, Power supplies, Design.

Results of the investigations carried out on the thermoelectric conversion of energy indicate that the class of materials selected for investigation, namely the I III VI_2 class of chalcopyrite-type compounds, is extremely promising and may contain materials having thermoelectric properties which are significantly better than those of any other materials whose properties are presently known. Results of the systems studies performed indicate that a mobile, thermoelectric power supply system using presently available thermoelectric materials would be appreciably heavier and larger than conventional systems. The disparity, particularly if comparison is made with dieselelectric systems, may not be as large as one might at first suspect, however. These studies indicate that high operating temperatures are extremely desirable from the standpoints of efficiency, size, and weight. The search for improved materials should, therefore, emphasize investigation of high temperature materials. (Author)

PB 158 851 $1.60

Naval Ordnance Plant, Indianapolis, Ind.
A METHOD FOR MEASURING THE DYNAMIC MAGNETIC PROPERTIES OF CORE MATERIAL, by James D. Patrick. 6 Oct 54, 16p. NAVORD rept. 940-1456.

DESCRIPTORS: *Magnetic cores, Materials, Magnetic properties, Measurement, Permeability, Permeameters

This report contains the basic circuits and theory of a method developed for the measurement of the dynamic properties of magnetic cores. This method is identified in this report as the AC Permeability Analyzer. (Author)

Electronics

PB 158 852 $8.10

David Sarnoff Research Center, Princeton, N. J.
STUDY OF MILLIMETER WAVE PLASMA OSCILLATION, by S. Bloom, A. L. Eichenbaum and others. Final rept. for 1 June 56-30 June 58 on Contract DA 36-039-sc-72793. 30 June 58, 81p. 39 refs. AD-204 184.

DESCRIPTORS: *Plasma oscillations, *Plasma physics, Production, Excitation, Microwaves, *Electrons, *Electron beams, *Backward wave oscillators, Operation.

Methods of generation of high-density plasmas suitable for studies of millimeter wave plasma oscillations are described. These studies indicate that such high plasma densities may be obtained in the hollow cathode glow discharge. Beam voltage and beam current density requirements for excitation of millimeter wave plasma oscillations are analyzed. The current densities required are prohibitively high using conventional electron sources. Studies of high-voltage electron extraction from a mercury pool arc discharge are described. Beam current densities of 30 A/cm^2 at 1000 volts have been obtained. A tube for studies of microwave properties of the beam is described. (Author)

PB 155 244 $3.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
INVESTIGATION OF MICROWAVE DUPLEXER SWITCHING MECHANISMS, by S. Takeda, S. Roux, and K. Rose. Quarterly progress rept. no. 5, 1 Apr-30 June 60, on Contracts DA 36-039-sc-78313 and AF 49(638)417. 15 July 60, 36p. 11 refs. AD-247 429.

DESCRIPTORS: *Radar duplexers, *Switching circuits, *Microwave equipment, Plasma physics, Shock waves, Propagation, Mathematical analysis, Semiconductors, Gas discharges, Cavity resonators, Transmission, Microwaves, Circuits.

The calculation previously derived is refined in order to take into account the non-negligible effect of the glass tube containing the high density plasma. The guided propagation of the wave is also considered. Experiments performed in a high density plasma show a good agreement between the calculated and the measured phase shifts produced by the complex reflection coefficient of that plasma. The heat conduction of a preionized plasma column is tentatively used to detect the passage of a shock wave at some distance from the point of observation and possibly measure the temperature of the electrons in its front. The shock wave (or heating discharge) produces in the afterglow of the plasma column a quenching of the light, which is detected by a photomultiplier. Quenching and excitation due to the shock wave are observed, influences of the discharge polarity and nonfully understood effects are reported. Research on semiconductor behavior in high level microwave fields was continued using resonant cavity techniques at eight millimeter wavelengths. Transmission measurements have been made at temperatures between the boiling point of liquid nitrogen and room temperature. (Author)

AD-257 819 $4.60

Lockheed Aircraft Corp., Sunnyvale, Calif.
PLASMA ACCELERATION WITH COAXIAL ELECTRODES, by Philip J. Hart. May 61, 42p. 13 refs. LMSD-894830.

DESCRIPTORS: *Plasma physics, *Plasma jets, *Shock tubes, Coaxial cables, *Electrodes, Capacitors, *Electric discharges, Simultaneous equations, Differential equations, Analog computers, Mathematical analysis.

The acceleration of a plasma by a capacitor discharge between coaxial electrodes is investigated theoretically and experimentally. Simultaneous differential equations are written for two cases; (1) the electrodes are used in a shock tube having a uniform gas distribution for a simple "snowplow" model of plasma motion, and (2) the electrodes are used to accelerate a constant mass of plasma into a vacuum. The equations are solved by analog computer for the plasma displacement, velocity, acceleration, the current and its derivatives, and various power terms, as functions of time. For the first case, plasma velocities and displacements, measured from streak photographs for several experimental arrangements, compare favorably with computer-predicted velocities until the peak velocity is attained; at this instant, which is the assumed limit of validity of the equations, a shock wave detaches from and moves ahead of the plasma disk. The actual current distribution in the space between the electrodes, as determined by a "difference" magnetic probe, is found to be rather complex, with current loops forming after the peak velocity is attained. Effects due to a distributed current are discussed. (Author)

AD-258 150 $3.60

National Bureau of Standards, Boulder, Colo.
AN APPROACH TO THE THEORY OF AN ANTENNA OVER AN INHOMOGENEOUS GROUND PLANE, by James R. Wait. Scientific rept. no. 13 on Antenna Patterns in the Presence of Finite Ground Surfaces, Contract CSO and A 58-40. 11 Jan 61, 38p. 27 refs. NBS Rept. 6739; AFCRL-16.

DESCRIPTORS: *Antennas, Mathematical analysis, *Dipole antennas, *Antenna radiation patterns, Integral equations, Theory.

An antenna over a flat ground plane is considered characterized by a variable surface impedance as in a radial-wire screen. The problem is formulated in terms of the mutual impedance between two vertical dipoles, one which is raised, and the other is located on the ground plane. The ground screen is taken to be in the combined form of a circular disc and a concentric sector. An approximate solution of the problem is obtained and the results are compared with previous investigations of closely related work.

Molecular Physics and Spectroscopy

PB 158 822 $2.60

Laboratory for Insulation Research, Mass. Inst. of Tech., Cambridge.
STUDIES OF THE OPTICAL ABSORPTION SPECTRUM OF RUTILE SINGLE CRYSTALS, by Bernard H. Soffer. Master's thesis. Rept. on Contracts [Nonr-1841(10)] and AT(30-1)1937. Aug 59, 28p. 30 refs. Technical rept. 140; AD-227 945.

DESCRIPTORS: *Single crystals, *Titanium compounds, Oxides, *Spectrographic analysis, Temperature, Absorption, Spectrophotometers, Optics, Dielectric properties, Crystals

The optical absorption of single crystals of synthetic rutile was investigated in the spectral range from 1200 to 25,000 cm^{-1} and from room temperature to 1000°C. The electronic absorption exhibits dichroic behavior. The edge moves toward lower energies as temperature is increased, with the shift depending upon the absorption coefficient; for a decadic absorption coefficient (α') of 400 cm^{-1} the shift is 7.1×10^{-4} ev/°K, while at 1 cm^{-1} it is 9.5×10^{-4} ev/°K. The broad band in the region of 6850 cm^{-1}, which occurs in reduced rutile does not appear in fully oxidized rutile, even at high temperature. At high temperatures an additional wavelength-independent absorption appears which, by applying the Drude-Zener theory of free carrier absorption, can be correlated with good agreement to dc conductivity. New bands in the 3300 cm^{-1} region are shown to stem from O-H valence vibrations. The main bands are unusually sharp, with

peaks at 3277 and 3322 cm^{-1} and half-widths of 28 and 13 cm^{-1}. Deuterium substitution causes an absorption at 2442 cm^{-1}. Changes in carrier density were detected in transmission measurements on a current-carrying crystal. (Author)

UCRL-9748 $0.75

Lawrence Radiation Lab., U. of California, Berkeley.
A COMPUTER ANALYSIS FOR COMPLEX SODIUM IODIDE GAMMA SPECTRA, by James F. Mollenauer. Rept. on Contract W-7405-eng-48. Aug 61, 34p.

PB 158 781 $14.00

Research Inst., U. of Michigan, Ann Arbor.
THE INFRARED ABSORPTION SPECTRA OF DIAMOND, SILICON, AND GERMANIUM, by William G. Simeral. Technical rept. no. 1 on Contract DA 36-039-sc-5581. 1 June 53, 202p. 121 refs. AD-21 423.

DESCRIPTORS: *Diamonds, *Silicon, *Germanium *Spectrographic analysis, *Infrared spectroscopy, Absorption, *Ultraviolet spectroscopy, X-ray diffraction analysis, Lattices.

Observations were made of the absorption spectra of diamonds in the far IR, in the vacuum UV, and in the region of atmospheric absorption near 6 μ. Variations of IR and UV absorption in individual diamonds and the effects on IR absorption caused by deuteron and neutron bombardment were determined. Comparisons between the spectra of diamonds and those of Si and Ge of various stages of impurity were made. An absorption band at 6.5 μ and another at 30 μ, not previously reported, were found for the diamond. The occurrence of bands between 2.5 and 6.0 μ with the same absorption coefficient in all diamonds was verified. Bombardment by neutrons and deuterons did not alter the IR spectra of diamonds, although marked changes occurred in the visible spectrum. The conclusion was that vacant sites are not the defects causing anomalous absorption in the IR. The branches of the frequency distributions were calculated for diamond, Si, and Ge. The observed combination spectra of Si, diamond, and Ge were explained in terms of allowed combinations, with the exception of 1 weak band in germanium which agreed with a combination band which could become active through an isotope effect. Theoretical considerations indicated that the IR absorption spectra of diamond, Si, and Ge can be accounted for in terms of the Born theory of lattice dynamics. Analysis of the IR absorption spectrum of diamond in terms of the Boron theory shows that the experimental results are in accord with the impurity theory.

Solid State Physics

PB 158 749 $5.60

Battelle Memorial Inst., Columbus, Ohio.
THEORETICAL AND EXPERIMENTAL STUDIES CONCERNING RADIATION DAMAGE IN SELECTED COMPOUND SEMICONDUCTORS, by Lee W. Aukerman, Eugene M. Baroody and others. Rept. on Contract AF 33(616)3747. 31 Jan 60, 60p. 28 refs. WADD-TR-60-45; AD-232 864.

DESCRIPTORS: *Semiconductors, *Radiation damage, Determination, Fast neutrons, *Single crystals, *Neutron bombardment, *Electrical properties, Diodes, Gallium compounds, Aluminum compounds, Indium compounds, Antimonides, Phosphides, Silicon compounds, Carbides

The process is studied theoretically by which a high-energy primary atom, produced directly by the incident radiation, distributes energy throughout a small region of the lattice. Experimental studies of radiation damage by fast neutrons were carried out on single crystals of n- and p-type AlSb, n-type GaAs, n-type InP, and to a lesser extent, on n-type InAs, and p-type CdTe. Some experiments were also performed on silicon carbide diodes. The experiments were concerned, for the most part, with the effects of fast neutron bombardment on various electrical properties of the semiconductors. Emphasis was placed on GaAs. Some of the electrical properties of irradiated GaAs can be explained qualitatively in terms of very small regions of intensely damaged material. In annealing studies, which were carried out on GaAs, a correlation between the type of annealing and the amount of damage seems to be present. This correlation may result from a competition between annihilation and trapping of the mobile defects. The rather large activation energy for annealing, about 4.5 ev, suggests this mechanism. (Author)

PB 158 843 $19.75

Gulton Industries, Inc., Metuchen, N. J.
INVESTIGATION OF SOLID STATE INSTRUMENTATION TECHNIQUES, by Daniel S. Schwartz. Final rept. May 60-Feb 61, on Contract AF 33(616)6359. Feb 61, 325p. 98 refs. WADD Technical rept. 61-9.

DESCRIPTORS: *Solid state physics, Instrumentation, *Transistors, *Oscillator circuits, *Relaxation oscillators, *Dielectric materials, *Semiconductors, *Transducers, *Ceramic materials, *Ferrites, *Polymers, Pyrolysis, Pressure, Temperature, Acceleration, Heat transfer, Measurement, Diffusion, Shear stresses, Piezoelectric effects, Frequency, Temperature, Resistance, Thermometers, Thermistors, Accelerometers.

Effort was directed toward the measurement of pressure, acceleration, temperature and heat flow. The major areas of investigation were the following: Unijunction transistors in oscillator circuits, piezocapacitive effects in high dielectric constant materials, mobility and diffusion effects in semiconductors, the direct and inverse piezoelectric effects and a "unidirectional temperature" independent strain transducer. In addition, preliminary and additional investigations were carried out on previously proposed heat flow rate schemes, piezoresistive shear effects, the acoustoelastic effect, piezoresistance in Ga Sb, the piezoresistive effect at high temperatures, high dielectric constant materials for temperature measurement together with experimental evaluations of piezoresistive and piezocapacitive ceramic materials. In addition to these studies, experimental unijunction transistors temperature probes have been fabricated and evaluated and experimentation has been initiated on the digital and analog measurement of heat transfer rate utilizing mobility and diffusions effects in semiconductors and digital accelerometers utilizing the inverse piezoelectric effect. (Author)

PB 153 462 $1.60

Materials Research Lab., Watertown Arsenal, Mass.
ABSOLUTE MEASUREMENT OF THE ATOMIC SCATTERING FACTORS OF IRON, COPPER AND ALUMINUM, by B. W. Batterman, D. R. Chipman, and J. J. Demarco. Feb 61, 19p. 13 refs. MRL rept. no. 90; AD-251 511.

DESCRIPTORS: *Iron, *Copper, *Aluminum, Transition elements. *Scattering, Atoms, Nuclear reactions, Measurement, Magnetic properties, X-rays, Reflection, X-ray diffraction analysis, Powders, Electron charge.

The X-ray atomic scattering factors of Fe, Cu, and Al were remeasured to obtain more reliable information on the outer electron charge densities in these elements. The scattering factors were obtained from measurements of the integrated Bragg intensities of powder samples using monochromatic MoK sub Alpha radiation. The intensities were put on an absolute scale by direct measurements of the power in the primary X-ray beam. Extinction, surface roughness, and preferred orientation effects were shown to be neg ligible in the samples used. The ratios of the measured scattering factors in the 3 elements agree with those calculated from Hartree-Fock theory to within 1%. This substantiates the findings of Batterman, and, indicates that there is no large discrepancy between the electronic structure of Cu and Fe. The absolute values of the measured scattering factors, however, lie about 4% below theory in the region of low sin theta/lambda. The high theoretical values for Fe and Cu could result from known differences in electronic structure between a free atom and one in the solid, but that present theory probably cannot account for the discrepancy in the case of Al. (Author)

PB 155 265 $1.10

Materials Research Lab., Watertown Arsenal, Mass.
THE ORIGIN OF THE F^{19} HYPERFINE STRUCTURE IN TRANSITION ELEMENT FLUORIDES, by A. J. Freeman and R. E. Watson (AVCO Corp.). Mar 61, 9p. 12 refs. MRL rept. no. 95; AD-253 851.

DESCRIPTORS: *Hyperfine structure, *Fluorides, *Transition elements, Nuclear magnetic resonance, Electrons, Paramagnetic resonance, Magnetic fields.

The F^{19} hyperfine structure has now been observed in many iron series fluorides by both electron paramagnetic resonance (EPR) and NMR. In a new theoretical investigation of the origin of this effect we have found that all previous phenomenological interpretations and theoretical analyses have neglected terms which are important for understanding the magnetic interactions and for determining the electron distributions in these materials. (Author)

ORNL-1762(Del.) $10.10

Oak Ridge National Lab., Tenn.
SOLID STATE DIVISION. Semiannual progress rept. for period ending 30 Aug 54. Dec 54, 128p.

PB 154 394 $8.10

Purdue Research Foundation, Lafayette, Ind.
SILICON CRYSTAL PERFECTION STUDY, by H. J. Yearian. Final rept. 1 June 58-31 Aug 59, on Contract DA 36-039-sc-77991. [1959] 81p. 25 refs. AD-246 269.

DESCRIPTORS: *Single crystals, *Silicon, Crystals, *Semiconductors, Growth, Crucibles, Ovens, Radiofrequency, Heating elements.

A modified Czochralski method was used to grow single crystals of silicon which were free of twins, slip bands and detectable dislocations over at least the first 90% of their volumes. The essential requirements were: (1) use of a deeply etched dislocation free seed of approximately 0.2mm diameter to minimize the formation and propagation of dislocations during seeding, and (2) maintenance during growth of a stress level below the yield stress. It was found that the conditions could be met without the use of after-heaters if the quality of furnace regulation and control permitted achieving a good weld during seeding and the maintenance of a slow expansion and steady growth of the crystal. It was necessary also that contamination of the ambient gas by hydrocarbon vapors and by gas recirculating from the graphite heater be kept at a very low level. The over-all yield of defect free material, including losses due to accidental deviation from the optimum growth conditions, was approximately 55%. The possibility of extending the small seed technique to growth from a floating zone formed on the top of a stock rod by RF heating was investigated. Techniques for using the Dash etch, decoration by either copper or platinum and the X-ray topographic methods of revealing dislocations were developed and compared. All of these methods were found to be reliable, although on some crystals the distinction between dislocation etch pits and extraneous pits was not marked. (Author)

Thermodynamics

PB 158 806 $10.50

Beechcraft Research and Development, Inc., Boulder, Colo.
POOL BOILING HEAT TRANSFER TO A CRYOGENIC LIQUID, by Charles R. Class, James R. DeHaan and others. Rept. on Contract AF 33(616)5178. Oct 58, declassified 20 Feb 59. 135p. 33 refs. Engineering rept. 6154; WADC Technical rept. 58-528; AD-214 256.

DESCRIPTORS: Cryogenics, Liquids, *Hydrogen, *Oxygen, *Helium, *Nitrogen, Boiling, Film boiling, Surfaces, Surface properties, *Heat transfer, Pressure, Test methods, Test equipment, Tests.

Heat transfer rates to boiling hydrogen from a flat surface 22 in. by 1 in. were determined experimentally. Results were obtained for both nucleate and film boiling. The apparatus and equipment used is described. The parameters varied are surface orientation, surface condition and pressure. The effects of these parameters are shown in crossplots of heat flux versus ΔT. Theoretical data, based on correlations obtained from the literature are compared with the results of this investigation. Experimental boiling heat transfer data of other investigators for oxygen, nitrogen, hydrogen, and helium are also summarized.

HW-69203 $0.50

Hanford Atomic Products Operation, Richland, Wash.
AN ADIABATIC CALORIMETER FOR STOPPING POWER MEASUREMENTS IN THIN FOILS, by H. V. Larson, I. T. Myers and others. Rept. on Contract AT(45-1)-1350. Apr 61, 12p.

HW-69275 $1.00

Hanford Atomic Products Operation, Richland, Wash.
AN ANALOG COMPUTER STUDY OF THE STARTUP PROCESS IN AUTOCLAVE TEMPERATURE CONTROL SYSTEMS, by C. D. Swanson. Rept. on Contract AT(45-1)-1350. Apr 61, 38p.

PB 155 209 $2.60

Heat Transfer Lab., U. of Minnesota, Minneapolis.
ANALYTIC FORMULATION FOR RADIATING FINS WITH MUTUAL IRRADIATION, by E. R. G. Eckert, T. F. Irvine, Jr., and E. M. Sparrow. Rept. on Research on Aerodynamic Flow Fields, Contract AF 33(616)5528. Dec 60, 22p. 7 refs. HTL Technical note no. 30; ARL Technical note 60-160; AD-252 807.

DESCRIPTORS: Heat exchangers, *Spaceships, *Heat transfer, Radiators, Integral equations, Differential equations, Thermal radiation, Fins, *Satellite vehicles.

Heat exchangers operating in space have to transfer their heat to the surrounding or absorb it from the surrounding by radiation. The performance of such heat exchangers can often be improved by fins on the heat exchanging surfaces. For an analysis of such a finned heat exchanger, the heat exchange process has to be formulated as a system of integral and differential equations as soon as the radiating surfaces can see each other. These equations are derived in a general form. They are then applied to the special case in which a tube is equipped with longitudinal or circumferential fins of uniform thickness. (Author)

Wave Propagation

PB 158 829 $3.60

Army Signal Research and Development Lab., Fort Monmouth, N. J.
MICROWAVE MEASUREMENTS IN PLASMAS, by Rudolf Buser and Paul Wolfert. 15 Sep 59, declassified 4 Nov 59. 37p. USASRDL Technical rept. 2060; AD-240 033.

DESCRIPTORS: *Plasma physics, *Microwaves, *Electromagnetic waves, Propagation, Reflection, Phase measurement, Magnetic pinch, Interference, Amplitude modulation, Refractive index, Magnetic fields, Theory.

A discussion is presented of theoretical and experimental aspects of microwave measurements in plasmas. The discussion includes a theoretical consideration of the properties of plasmas with respect to electromagnetic wave propagation, with and without the presence of a magnetic field. Experimental results are also included, giving measurements of the transmitted and reflected amplitudes, phase measurement of the transmitted wave, and phase measurement of the reflected wave.

TID-12845 $8.60

Electrical Engineering Research Lab., U. of Illinois, Urbana.
RESONANT ELECTROMAGNETIC MODES IN GYROELECTRIC PLASMAS, by Joseph J. Stafford. Technical rept. no. 5, on Contract AT(11-1)-392. Mar 61, 97p.

PB 158 807 $5.60

Microwave Physics Lab., Sylvania Electric Products, Inc., Mountain View, Calif.
ENERGY TRANSFER IN PLASMAS. Technical note no. 4 on Contract AF 30(602)2050. 19 Feb 60, 51p. 10 refs. RADC-TN-60-54; AD-234 922.

DESCRIPTORS: *Plasma physics, *Electromagnetic waves, Propagation, Mathematical analysis, Numerical analysis, Special functions, Energy, Acoustics.

A mathematical analysis of electromagnetic propagation in an inhomogeneous plasma is given. WKBJ methods are extended by the use of certain classes of Hankel functions and hypergeometric functions. Density profiles are found for which solutions can be given in exact form. The effects of plasma nonlinearities on the propagation of electromagnetic waves is discussed. Calculation of the generated second harmonic frequency shows that there is no indefinite buildup with distance. Moreover, except in the neighborhood of cyclotron resonance, power losses to the harmonic are entirely negligible. An experiment designed to produce a controlled non-uniform plasma is briefly described. A suggestion to use acoustic waves as a diagnostic tool to measure energy transfer between electrons and the gas is discussed. (Author)

RESEARCH METHODS, TECHNIQUES AND EQUIPMENT

PB 154 877 $3.60

National Research Labs., Ottawa (Canada).
THE N. R. C. SUBMERSIBLE PHOTOGRAPHIC WATER TEMPERATURE RECORDER MK. I, by E. H. Bowler and A. B. Forward. Sep 60, 31p. Mechanical engineering rept. MI-823; N. R. C. no. 6114; AD-252 093.

DESCRIPTORS: Temperature sensitive elements, Temperature, *Thermometers, *Photographic recording systems, Recording devices, Cameras, Canada, Photography, Underwater cameras, Design

This report describes a submersible photographic-type recorder primarily to be used for river water temperature measurements. The temperature-sensing elements in the instrument are glass-stem thermometers, using mercury or other suitable

liquid. Accuracies of the order of 1/100 degree centigrade and possibly up to 1/500 degree centigrade are obtainable depending on the quality of the thermometers, the temperature range required, and the resolution of the film used. A 35-millimeter camera (frame size 18 x 24 millimeters) capable of taking 72 consecutive exposures (500 exposures with special magazines), records the temperature readings. (The instrument has been arranged to record one exposure per day, but the frequency of exposures taken can easily be decreased or increased for a particular application.) The maximum depth of submergence is limited by the strength of the external case, and for the present design is 200 feet, when the case is sealed at atmospheric pressure. (Author)

PB 158 805 $5.60

Research Lab. of Electronics, Mass. Inst. of Tech. Cambridge.
SAMPLING MODELS FOR LINEAR TIME-VARIANT FILTERS, by Thomas Kailath. Master's thesis. [Rept. on Contract DA 36-039-sc-78108]. 25 May 59, 52p. 27 refs. Technical rept. 352; AD-230 489.

DESCRIPTORS: *Communications theory, Differential equations, *Radiofrequency filters, Fourier analysis, Transformations (Mathematics), *Sampling, Diversity reception, Transmission.

A large class of communication channels can be represented by linear time-variant filters. Different constraints can be imposed on these filters in order to simulate the actual operating conditions of such channels. The constraints permit the original filter under the operating constraints. These new filters need not resemble the physical channel at all, and need not be equivalent to the actual channel, except under the given constraints. The constraints considered are those of finite input and output channel signals and finite channel memory. Other cases can be studied by similar methods. Methods of characterizing linear time-variant filters are investigated in order to determine the most convenient descriptions for the different constraints. These descriptions are used to obtain sampling theorems and models for the filter under the various constraints. The theorems are used to find the conditions under which a linear time-variant filter can be determined by input-output measurements only. (Author)

SOCIAL SCIENCES

PB 158 765 $2.60

Aerospace Medical Lab., Wright Air Development Div., Wright-Patterson, Ohio.
AN ANNOTATED BIBLIOGRAPHY OF USAF PHYSICAL ANTHROPOLOGY FROM JANUARY 1946 TO OCTOBER 1961. (FOURTH EDITION). [1961] 26p. 56 refs.

DESCRIPTORS: *Anthropology, Bibliography, Aviation personnel, *Anthropological data, Anthropometry, Personnel.

PB 157 513 $1.10

Burden Neurological Inst. (Gt. Brit.)
THE AVOIDANCE OF OVER-WRITING IN SELF-ORGANISING SYSTEMS, by W. Ross Ashby and J. Riguet. Technical rept. no. 1 on Contract N62558-2404. 19 Oct 60, 10p. 3 refs. AD-249 543.

DESCRIPTORS: *Literature, Reports, *Documentation, *Programming, Quality control, Processing, Computers, Errors, Great Britain.

When a whole computation or adaptation must be achieved by stages, so that earlier results must be preserved for use in later stages, the intervening processes must not be allowed to overwrite, and destroy, the results found earlier. In today's computers, the programmer looks after this possibility, but when systems become self-organising, with a random element, over-writing internally is only too apt to occur. There are two ways in which over-writing can be avoided (or minimised). Information in the necessary quantity must be processed and utilised, or the general parameters of design must be so chosen as to reduce the chance level to a satisfactory degree. The second way also demands that an appropriate quantity of information be processed. These deductions are not in themselves surprising, but demonstrate that these two methods are the only two, so that the limitation is binding both on the brain and on any constructible computer. (Author)

PB 158 738 $4.60

Bureau of Applied Social Research, Columbia U., New York.
ESTIMATING A NATION'S URBAN GROWTH, by A. J. Jaffe, Carl Hammer, and Dorothy F. Jahn. [Rept. on Afirm, Contract AF 33(038)129091. Dec 52, 45p. 20 refs. [HRRI Technical Research rept. no. 12].

DESCRIPTORS: *Urban areas, Growth, Mathematical prediction, Economics.

An attempt was made to ascertain a suitable regression equation which could be used for estimating, with a reasonable degree of confidence, the total urban growth of a country when the following information is given: (a) percent change in size of total population of the country during the time period under consideration; (b) percent change in the index of manufacturing production during the same time period; (c) level of urbanization reached as of the beginning of the time period.

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- Development of new products
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